MODEL AIRPLANE NEWS

MAY 1949 • 25 CENTS

WALT GOOD'S NEW R.C. PLANE

ONTEST-PROVEN FF RUBBER MODEL

SCRAP BOX

By BILL WINTER

"FOR a long time I have been burning with a slow fever which has now finally come to a boil," announces Bill Clark, Jr., of State College, Pa. Many are the heads that are going to get bumped in this lively discussion. Some will agree. Some won't, including those "sordid (joke) commercial interests." So let's give Clark his say and then smooth ruffled feathers.

Clark originally was a "yo-yo" hater but turned to control flying for the usual reasons of too much chasing, no room to fly, and the perhaps unusual one of too many rules hampering originality in free flight design. He believes that the AMA has too much control of the modeler who just wants to enjoy his hobby. "I fully believe that there should be a national governing body but I do not believe that it should have the power to make anyone feel that he has to give up his favorite sport," says Clark.

"For a modeler to do anything at a championship meet, he has to have a custom job, or as Tony Grish told me, take apart ten or twelve engines and make one good one out of the lot," charges the man from State College. Or else it is a good idea to have an "in" with various mfgrs. to get new engines. In free flight I would challenge anyone, because I feel my stock *Forster 29* and ten-year old *Bantam*, combined with over 20 years building, is as good as any custom engine, but it is the new kids who get discouraged by the *hot rocks*. The average young lad cannot own four different classes of engines, therefore the more rules he has to abide by the more discouraged he becomes. Why spoil his fun with rules that make his model weigh so much, and look thusly, and have a landing gear that is just so? If the AMA does not lay off the controline business it will kill that, too, and then where will we be?

"We now have four classes of competition in both free flight and controline, and each one requires a different engine. I would like to see an added class," suggests Clark, "especially in free flight, with no restrictions whatsoever. No loadings of any kind, either power or area, no take-off or landing gear rules, no size or weight limitations and, most important, no engine classification. Allow a *Bantam* to compete against a *McCoy 60*. I have seen Class A ships climb as fast as *Hornet*-powered *Zippers* and vice versa. The rules now tend to limit design and originality whereas this 'wild open' class would bring out, along with the usual freaks, some terrific designs. In speed it is really an accomplishment to see just how sleek and small a speed model can be built. Suppose it doesn't look like the real thing. It is not supposed to."

Well, Bill, you sure got around. To begin with, we are duty bound to explain that some of the engine people are quite touchy about charges of custombuilt engines, and so on. McCoy, for example, has stated to this magazine that they are providing no custom engines, even to men like Storey. Someone has asked us how much, after all, can you do to a *Dooling*? The real mechanical artistry goes on at home where people with machine shop savvy and some knowledge of engines really do the souping up, not in the factories. Perhaps officials should carry detailed engine specifications from manufacturers and "mike" all record-making engines. This would be tough on the lathe artists, but right now the latter are more than tough on we ordinary mortals. Taking apart a well-fitted engine for an official check seems like a crime but what other protection can be offered the average contestant? And let's stop kidding ourselves. Tell the truth, and admit he hasn't got a ghost of a glimmer of a chance. As to manufacturers playing favorites, there have been cases in the past at least where really hot engines have got into the hands of prominent contestants. Let's hope that manufacturers today forego this temptation. Ordinarily, we don't blame them and, moreover, feel that it is their right to do so; but when it comes to model building by the average boys, the unfair advantage of the hot engine, be it custom or home-workshop variety, can break the game wide open.

Clark also berates the much battered Academy. Even five years ago there might have been substance to such charges but today, Bill, it ain't so. In our opinion, the AMA has gone overboard on this "being democratic" stuff. What you really are striking at, Bill, are the rules a majority of us determine each year. The writer doesn't like some of the rules either but, under this democratic process, who can like all the rules? The midwest wants to kill the r.o.g. requirement in free flight, giving the builder the choice between 15 sec. hand launched, and 20 sec. r.o.g., but this move was thwarted in the last rules voting. Your own East, Bill, may not have been ready for this radical break.

Frankly, we wonder just how good it is to let every individual have his say on rules. True, we all wanted it this way but, if things were handled in similar manner in football, for example, there would be goal posts on the 50-yard line in 1949, three goal posts in 1950, one goal post in 1951, and so on. On the otherhand, too much power should not be placed in the hands of any committee, no matter how well-meaning. Right now we have genuine experts charging that committeemen won't listen to them

(*Turn to page 8*)

Some members of the Coral Gables Modelairs (Fla.) who put on a 30-min. exhibition of C. L. flying at the Miami All-American Air Maneuvers. They had hoped to stage a miniature Goodyear race, but time was too short

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U-CONTROL ACCESSORIES

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THE NON-STOP round-the-world flight of the Boeing B-50 *Lucky Lady II* indicates the crossing of about the last aviation barrier, for assuredly an airplane can now fly *any* distance—provided it has the refueling bases to work from. By covering the 23,452 miles around the world non-stop, the B-50 has put an end to long-distance flying records, although the NAA has not recognized refueling endurance or distance flights for more than 10 years. In contrast to the old-fashioned method of having a crewmember hang out in the breeze to grapple at a dangling hose, the fliers use an "untouched-by-human-hands" system in which the B-50 trails a line from the tail, the B-29 refueling plane fires a grappling hook line across this and the B-50 reels in its line. The other end of the grappling hook line is attached to the refueling hose of the B-29 and is coupled into the tail of the B-50 automatically. After the fuel has been transferred, the line is cut loose automatically and the B-50 continues on its way. Neat, huh! But without those four refueling bases the flight would have been impossible. Actually, in combat, the B-50 and its B-29 refueling planes would take off together, fly out 3-4,000 miles at which point the fuel transfer would be made. This method would increase the radius of the B-50 bomber by about one-third and permit it to hurdle that last 1-2,000 miles that Breguet's law has prohibited through all these years. The flight was a real technical achievement and we say: "Hats off!" to the crew and to the U.S. Air Force.

LATEST AND easily the most radical Air Force fighter ever built is the Convair Model 7002, first of the "delta-wing" aircraft designed for supersonic speed. The airplane, which has made numerous successful test flights at Muroc Air Force Base, Calif., is a research airplane built to test the flying qualities of the delta-wing, which features a sharply swept wing (60°) with a straight trailing edge. Movable surfaces along the trailing edge act as both elevators (when moved up and down in unison) and ailerons (when moved differentially). The vertical surface is similarly shaped with a sharp 60° sweepback and a conventional rudder. The tiny research airplane is powered by an Allison J-33 turbojet engine developing 5200 lbs. of thrust with the aid of water-injection. When an airplane reaches supersonic speed, a conical shock wave is generated at the nose and extends rearward and outward at an angle depending upon the speed. Designers have learned that if the wing is swept back at an angle steeper than this "Mach angle," its drag will be considerably reduced. With sweep-back angles of more than about 45°, however, it appears simplest to merely fill in the trailing edge of the wing to a triangular shape, since the rear portions of the tip are not very far apart anyway. (Take pencil and paper and try it!) Engineers have long known that the delta-wing would eventually prove necessary when airplane speeds become high enough, and this, the first of them, is certain to be but the beginning of a long line of delta-wing designs. So all of us had better get used to this odd shape—it will be with us for a long time to come!

AND SPEAKING of speed, the Navy's Douglas D-558-II *Skyrocket* is finally getting set for its long-awaited assault on the world speed record. There has never been much question but what the swept-wing, low aspect-ratio *Skyrocket* research airplane would eventually prove the fastest in the world but not until now has the Navy set out to prove it. The gleaming white research airplane is powered by a Westinghouse 24C turbojet engine plus a Reaction Motors four-barreled rocket engine, the same as is used on the supersonic Bell X-1. In addition, two JATO units are used on the *Skyrocket* to get its highly-loaded wing into the air fast. The pointed-nose speedster has made many, many flights on its turbojet engine alone, investigating its air handling characteristics, but only recently has its rocket engine been installed. Bad weather at Muroc has delayed its tests for several months since it uses the "dry" lake bed for its take-offs and the lake bed hasn't been dry now these many weeks.

NAVY ALSO wants to keep the speed contest fair by cracking the record with a standard, fully-armed combat plane and the Vought XF7U-1 *Cutlass* is being readied for this purpose. Navy wants the swept-wing fighter to beat the Air Force F-86A

(*Turn to page 40*)

REPORT FROM THE WEST

by Lew Mahieu

IN addition to our story about Bob Holland this month, we will give later some news of clubs and coming contests.

First though, we take pleasure in introducing one of the outstanding modelers and the 1948 National Champion, Mr. Robert Holland. Bob, as his many friends call him, is really a swell fellow. With his lovely wife and two children, he resides in (sunny) Sunland, California. Sunland is a few minutes drive from his work at Burbank where he is employed as an engineer by the Lockheed Aircraft Company.

He is now thirty-four years of age and has been building models for the past twenty-three years. Many of the West Coast boys will remember those two beautiful free flights Bob flew for several years. One was a *Zipper*, the other a *Mercury*, and both were covered with yellow paper and trimmed in the most striking way with blue. Bob said he spent over four hundred hours on each ship. We think that is a lot of time, but not Bob. Anyone who has seen his work knows what we mean. He takes his time and makes 'em perfect, right down to the "nth degree." Getting back to the *Zipper* and the *Mercury*, we think the time was well spent, because there wasn't a contest that passed from 1941 to 1945 without Mr. Holland walking off with two or three of the trophies.

Bob's 1948 Wakefield entry took 3rd place, top for all American Wakefield fliers

Maybe Bob's contest record is partly due to his wife and her encouragement toward his model building and flying. He has flown in seventy-five contests in the past ten years and modeling rules the house, with thirty some trophies decorating the living room. Drawing table and drawing instruments fill the dining room and the garage is about four fifths full of benches, material and airplanes. Yes, Bob is a typical model builder; he devotes a lot of time to his hobby and the results speak for themselves.

Bob is a versatile modeler, flying almost every type and size of plane. In competition he has flown every event except U-control and is tops in anything he goes after. He goes in for a great deal of sport flying with unique designs. We have seen Bob with some fine examples such as flying wings and catapult gliders. He designed and built two free flight flying wings of similar size using an *Elf single* for power; both of these models flew remarkably well. One Sunday at Western and Rosecrans, Bob really put on a demonstration of catapult gliders. Using about four strands of 1/4" rubber, 25' long, he hooked on a small plywood glider, about 6" in span. Stretching out the rubber some 50', Bob took careful aim and turned it loose; like a shot the glider went so fast that you had to look ahead of where it was in order to see it. You know, like watching a golf ball on the tee-off. We would estimate the speed at 75+. The crowd that gathered was amazed, as we were. We were very much impressed and will long remember that incident.

Bob Holland and wife Clara pose with Atwood 49 powered ship and trophy it took at '48 Plymouth International Meet

Bob's favorite is indoor building and flying. He has had less experience with this phase of modeling, but prefers it for competition, and is already on top.

He is also very active in his local club. Bob is contest director for the *San Valeers* who boast a membership of forty-five. Prior to joining the *San Valeers* two years ago he was a member of the *Thermal Thumbers* for one year. During the war he was affiliated with the *Los Angeles Aero Modelers*.

Bob is a swell person to know and fly with. He is a consistent winner as his past contest record shows. We can't think of anyone who has worked harder or deserves the title of the National Champion more than Bob Holland.

Now for some news of what's doing in a few of the West Coast clubs. The *Flight Masters* of Inglewood, California held an A.M.A. (club) towline Contest on February 20. With the new rules allowing two hundred feet of towline there was a slight advantage and a chance to break some records. Only one record however was broken; that was class D open. Ray Acord now holds the record with a three

(*Turn to page* 36)

Lud Kading displays his tiny free-flighter. Infant power, of course!

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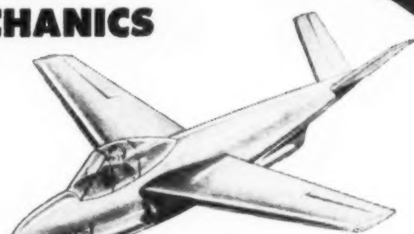

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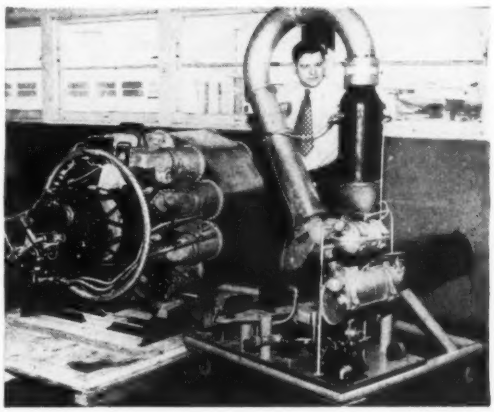

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Scrap Box

(*Continued from page* 1)

and, on the other hand, committeemen who think it wrong to listen to the super expert. How about those contest directors? They know local trends, problems and shortcomings. Should we ask them? And while we are at it, let's avoid this business of letting people who know nothing of U-control have a whack at the yo-yo boys' rules, and vice versa. Under the present setup, many people vote on matters in various categories that they really know nothing about. With leader members paying more dues, the tendency, naturally, has been to have more leader members, and too many people to vote.

Clark has put his finger, perhaps unknowingly, on the root of the evil in pointing out the natural resentment to ever-expanding rules control. But that is not AMA's fault. AMA, whatever its other faults, truly is acting as a clearing house on rules opinions from all corners of the compass. The fundamental trouble, the excuse for rules, springs from the inevitable results of competition. This may be an oversimplification, but a man that is an all-round athlete can be ruined for one sport by concentrating on another, for the reason that different muscles come into play. The basic free flight or controline model will, in the beginning, be generally acceptable to everyone. For example, there is the *Fireball*, still an interesting airplane to general modelers but quite useless to people who have evolved into speed demons or stunt artists (though Jim Walker's stunting of a *Fireball* is as pretty a sight as you ever will see). Competition quickly breeds special rules which, year after year, continually narrow down each branch of modeling until, as far as contests go, modeling becomes the exclusive property of the super expert. What killed indoors? Or free flight? How can you explain the slumping off in controline that some manufacturers have been talking about? Most important, do highly detailed, restrictive rulings kill model building? Here is Clark and others—that say so. It must be a matter of future policy that rules be prevented from freezing out the average man.

* *

C. S. "Rushy" Rushbrooke, editor of the British Aeromodeller, makes the point that the British team did not have the advantage of special Dunlop rubber in the last Wakefield meet at Akron, Ohio. It will be recalled that America lost principally (in view of Chesterton's consistent performance perhaps we should say partly!) because our brown rubber laid down on the job. "This is most definitely not the case," Rushy tells us. "Copeland hardly would have changed to T56 if it had been so and, as a matter of fact, I doubt very much whether Dunlops were aware of such a thing as the Wakefield until after the event. I shall be glad if you will refute this rumor in the *Scrap Box* as it is entirely incorrect and may lead to the assumption that our boys were assisted by the trade, which definitely was far from being the case."

It was another British authority who passed on this information, or rumor, so the matter of Dunlop's rubber—the great Dunlop Rubber Mystery—may never be cleared up. Shall we try to solve the riddle? Here are some of the facts. At the last prewar Wakefield the British black rubber failed miserably in the heat at Bendix, N. J. At Akron, the American rubber did the same thing, whereas English black was comparatively unaffected. American boys who never had the trouble before when flying in high temperatures—as in California—blamed the difficulty on the terrific humidity at Akron. Ron Warring, well-known British Wakefield authority, informs us that in two high-time eliminations flights he made last year our brown rubber was used for one, Dunlop black for the other. Having observed Lanzo winding black rubber at Olathe, we can say that British rubber has a greater turn capacity and less of an initial burst, giving a smoother power curve. Dick Schumacher confirms this after trying the stuff. In all

(*Turn to page* 57)


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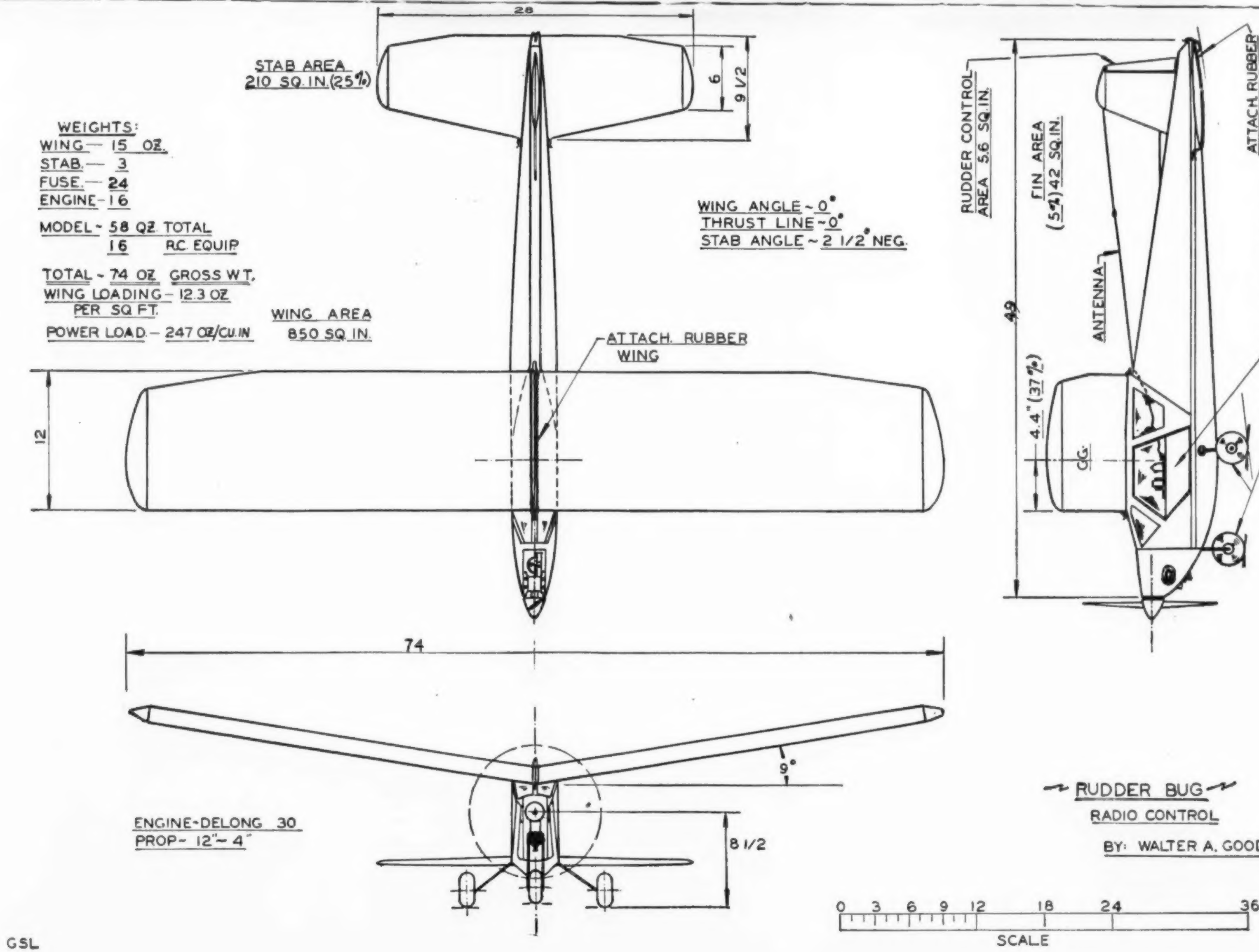
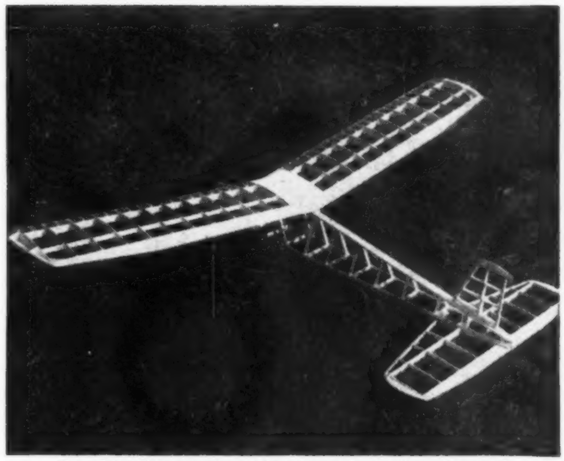
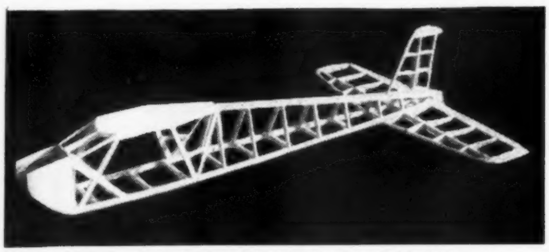

STAB AREA
210 SQ. IN. (25%)
28
6
9 1/2
WEIGHTS:
WING — 15 OZ.
STAB. — 3
FUSE. — 24
ENGINE - 16
MODEL - 58 OZ. TOTAL
16 R.C. EQUIP.
TOTAL - 74 OZ. GROSS W.T.
WING LOADING - 12.3 OZ
PER SQ. FT.
POWER LOAD. - 247 OZ/CU. IN
WING AREA
850 SQ. IN.
WING ANGLE ~ 0°
THRUST LINE ~ 0°
STAB ANGLE ~ 2 1/2° NEG.
ATTACH. RUBBER
WING
12
74
9°
8 1/2
ENGINE - DELONG 30
PROP - 12" ~ 4"
RUDDER CONTROL
AREA 5.6 SQ. IN.
FIN AREA
(5%) 42 SQ. IN.
ANTENNA
49
4.4" (37%)
C.G.
ACCESS DOORS
BOTH SIDES
3" DIA.
ATTACH. RUBBER
RUDDER BUG
RADIO CONTROL
BY: WALTER A. GOOD
0 3 6 9 12 18 24 36
SCALE
GSL

RUDDER BUG

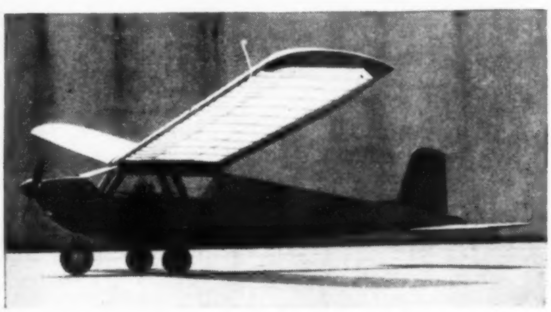
PART ONE



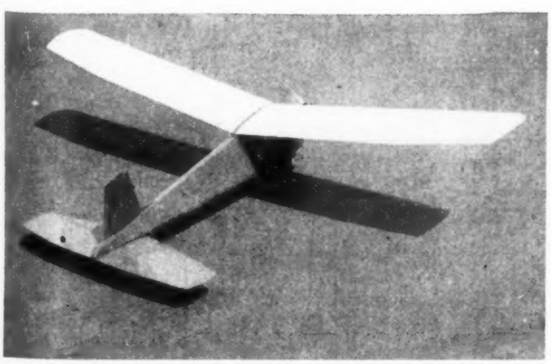
Completed framework ready to cover is simple and rugged



Area under wing is designed to give large unobstructed space



Tricycle gear assures good take-off and taxiing qualities



An attractive model, *Rudder Bug* was designed for a purpose

By Walter A. Good

THE *Rudder Bug* exemplifies the new trend in radio control models—simplicity. It is a far cry from the prewar "giant" R.C. models and a pleasant departure from freeflight gas R.C. conversions. Here's a model designed especially for existing radio equipment; it embodies many design features which are unique for radio control models.

In recent years it has become steadily apparent that the radio control gear is no longer the limiting factor in controlled performance. Strangely enough, the number one problem is the design of the model! The general impression of radio control builders at the 1948 Nationals was that final performance depends about 75% on model design, and 25% on radio gear—of course, with lots of practice added.

Thus, since the model design has assumed such importance, what are the design factors involved? Briefly they are: overall size and payload, stability, number of controls, engine power, accessibility of gear, poweron-poweroff characteristics, landing gear, and ruggedness. These factors are discussed in detail below.

The *Rudder Bug* has almost 6 sq. ft. of wing area, the wing spanning 6' with a 12" chord. It weighs in at 74 oz., which includes 16 oz. for the radio gear. The 1 lb. payload is easily carried. The body has a semi-scale appearance with a cabin which sports two king-size access doors. The length is 49". The tricycle landing gear makes for good take-offs, and landings too. Power is an inverted *DeLong 30*. The radio control gear is a standard Beacon Electronics set, consisting of a transmitter, receiver and rudder escapement. Only rudder control is used which has been found to be very effective, hence the name *Rudder Bug*.

The *Rudder Bug* was in the drawing stage for several years. Almost a year of limited sparetime was consumed in the building—it wasn't quite complete in time for the 1948 Nationals! During six months of flying, the ship has logged 63 flights and verified many of the design ideas involved. Now let's talk about the design.

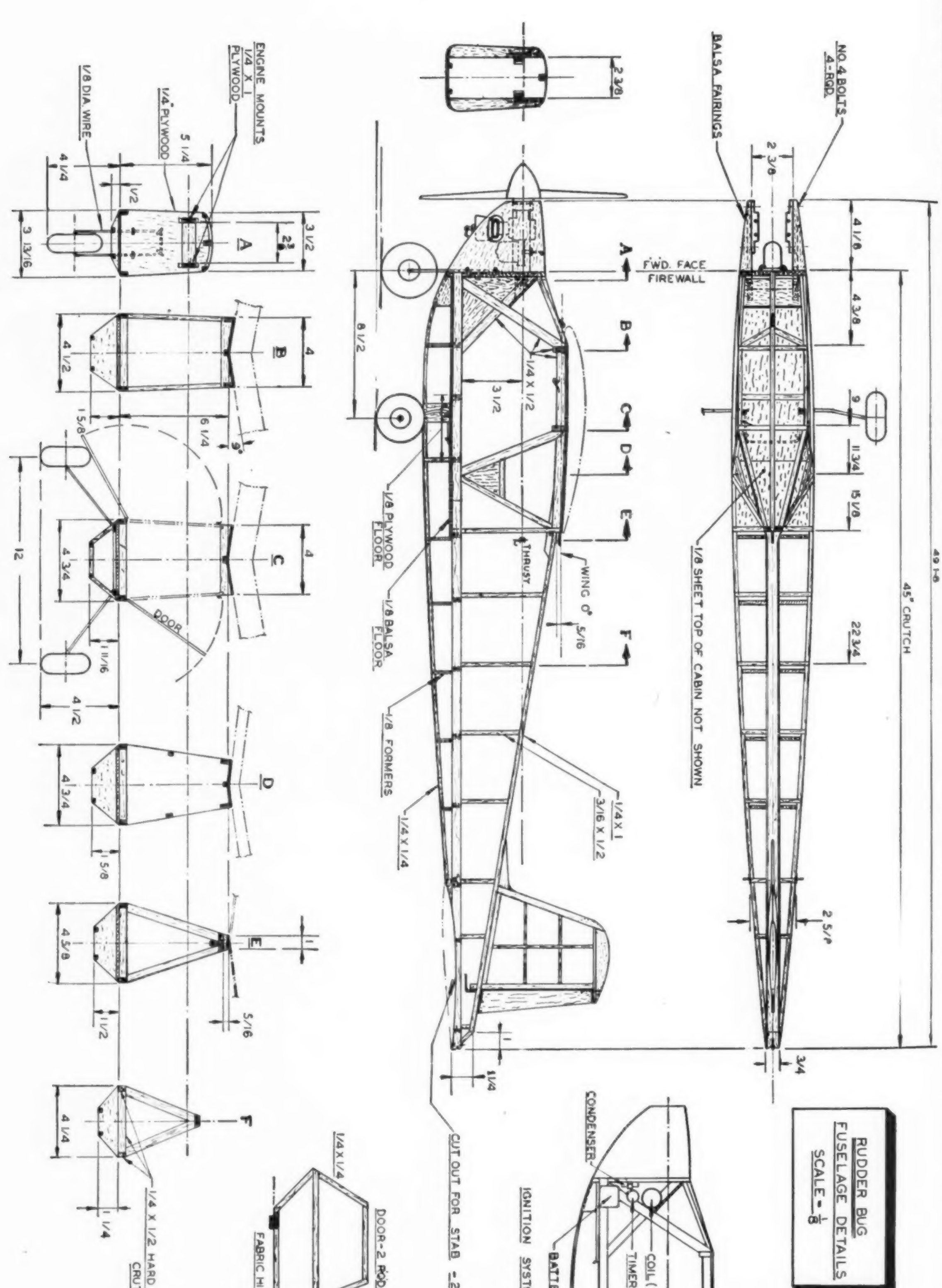
Large R.C. models (above 8' span) are certainly beautiful flyers, as demonstrated by Charley Siegfried and others. They, unfortunately, do have two distinct disadvantages—they are awkward to transport, and require many long hours of building and repair time. How about small (below 5' span) models? They are easy to transport and build.

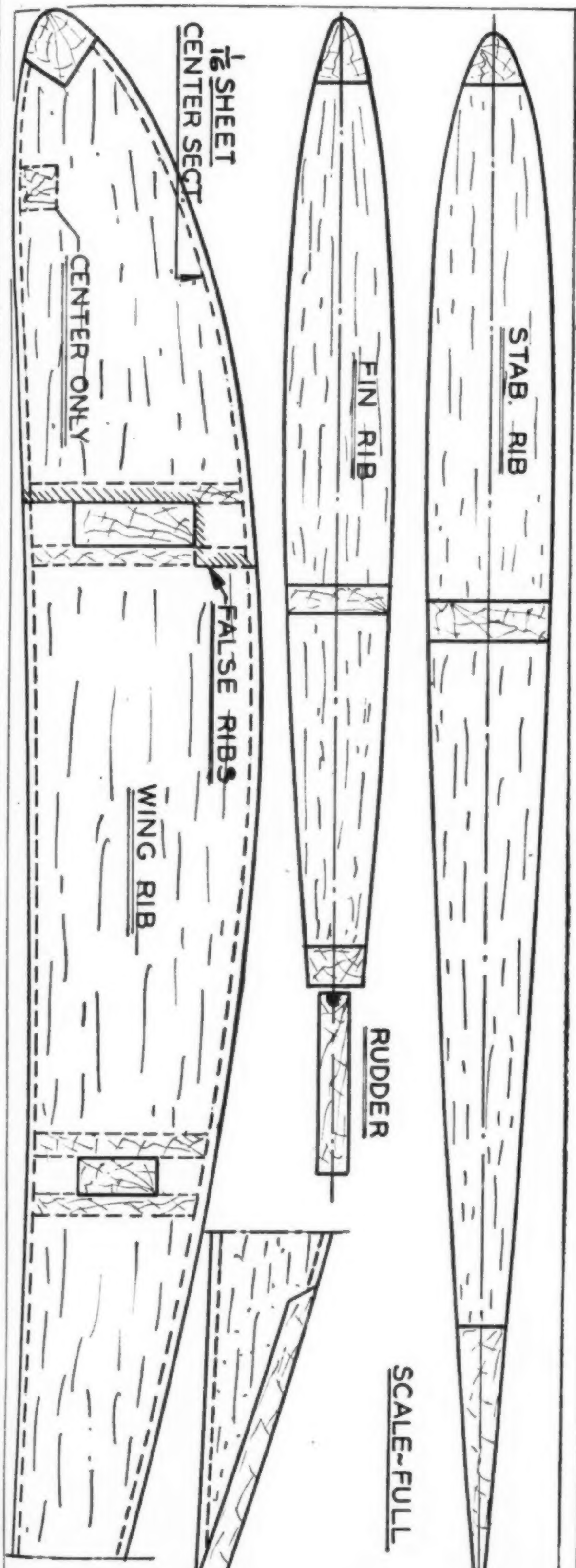
It has been observed, however, that they rapidly shrink from view during flight maneuvers, giving the operator the feeling he's "controlling" a small dark blob rather than an airplane structure. Small models may have difficulty carrying the necessary radio gear with ease. The 6' size of *Rudder Bug* is felt to be a reasonable compromise. Note how this size lends itself to conventional types of construction.

Good longitudinal and spiral stability are prime requisites of the radio control model. For this size model, Frank Zaic suggested that a 25% stab would be about right for a quick

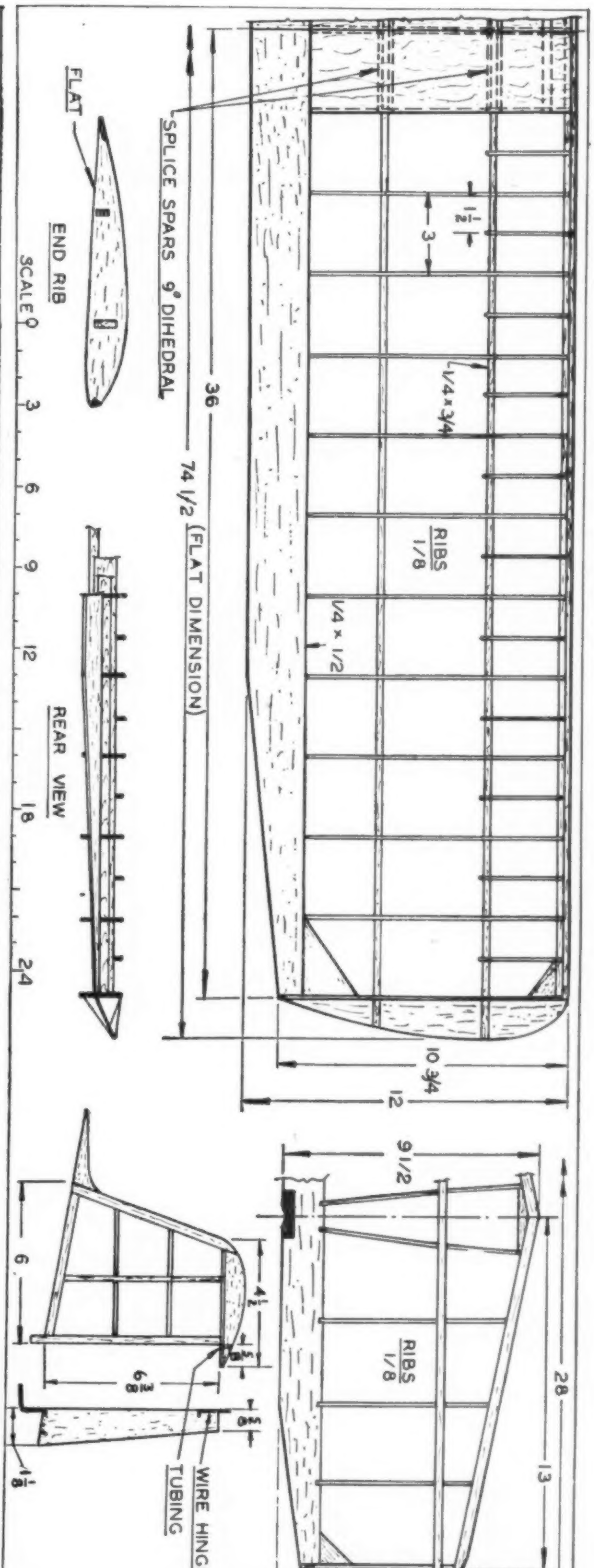
(*Turn to page* 37)

Walt Good has retired faithful old Guff, a real veteran, and has produced this up-to-date design for radio control


RUDDER BUG
FUSELAGE DETAILS
SCALE = 1/8
NO. 4 BOLTS 4-REQ.
BALSA FAIRINGS
FWD. FACE FIREWALL
1/8 SHEET TOP OF CABIN NOT SHOWN
45° CRUTCH
1/4 X 1/2
WING 0°
THRUST
1/8 PLYWOOD FLOOR
1/8 BALSA FLOOR
1/8 FORMERS
1/4 X 1/4
1/4 X 1
3/16 X 1/2
CUT OUT FOR STAB -2 1/2°
CONDENSER
COIL (LEFT SIDE)
TIMER (R. SIDE)
BATTERY
IGNITION SYSTEM
ENGINE MOUNTS 1/4 X 1 PLYWOOD
1/4 PLYWOOD
1/8 DIA. WIRE
DOOR
DOOR-2 REQ.
1/4 X 1/4
FABRIC HINGE
1/4 X 1/2 HARD BALSA CRUTCH
A
B
C
D
E
F
GSL



1/16 SHEET CENTER SECT
CENTER ONLY
FALSE RIBS
WING RIB
FIN RIB
STAB. RIB
RUDDER
SCALE~FULL

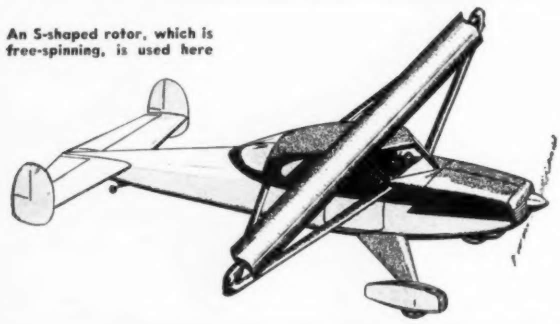


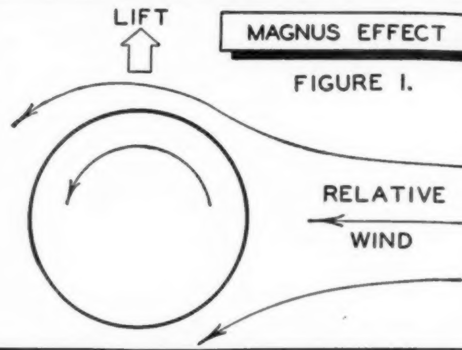
SPLICE SPARS 9° DIHEDRAL
FLAT
END RIB
SCALE 0 3 6 9 12 18 24
REAR VIEW
36
74 1/2 (FLAT DIMENSION)
1 1/2
3
1/4 x 3/4
RIBS 1/8
1/4 x 1/2
10 3/4
12
9 1/2
RIBS 1/8
28
13
6
3/4
4 1/2
6 3/8
1 1/8
WIRE HINGES
TUBING
GSL

THEORY OF

Here is an interesting field of exploration

An S-shaped rotor, which is free-spinning, is used here





MAGNUS EFFECT

FIGURE I.

by Roy L. Clough, Jr.

THE science of designing flying machines has evolved a number of basic approaches to the problem of flight, and frequently it has turned out that as theoretically sound as some of these ideas appear to be when presented, the practical application is long in coming forth.

A good case in point is the helicopter which had to await the development of the autogiro in order to borrow its articulated blade system and out-perform it. Again and again cases of this sort are borne out; experience with one type of application has resulted in uncovering knowledge of value toward the realization of others. We find the turbo-supercharger becoming a jet engine, the aileron control of one type becomes the spoiler of another and the dive recovery flap, of a third. Simple mechanical principles often beget great technical advances once the "angle" is realized. The improbable becomes the possible, the impractical feasible. Today, when each new discovery shows up a dozen more, it should be no great matter for surprise if some of the older temporarily discarded notions of aircraft suddenly blossom out with new technology and make a bid to prove their worth.

The writer, who is not so very old at that, can remember being ribbed for suggesting that jets and rockets were the logical mode of propulsion for high speed aircraft, and it was not so very long ago that those "who knew" said that helicopters would never be practical.

Once upon a time there were people who snickered because other people suggested a bag of hot air could lift a man from the ground. That's the way it goes, but lest we get smug about it, it seems we are still laughing at those people who periodically try to build an airplane that will sustain and propel itself by flapping its wings. Some day it will be done, of course. That is the way of things that dreamers dream.

The Flettner rotor airplane is another one of these great ideas that so far has not paid off. A few years back there were many sketches and articles dealing with proposed rotor aircraft in just about any journal one might pick up but the planes never appeared. Now, just what is a rotor plane, how is it supposed to operate, and what are the major difficulties involved?

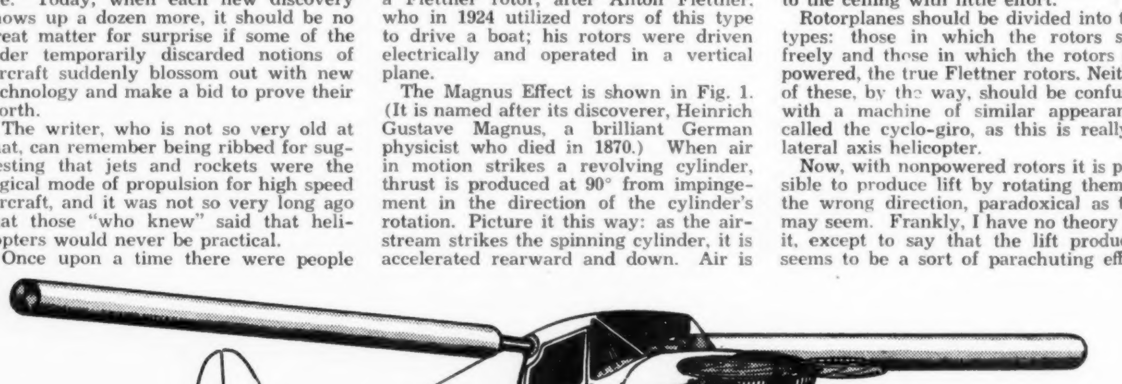
The basic premise of the rotorplane is that lift be obtained through the Magnus Effect, and that the principle lifting surface be a laterally rotating unit, usually a drum or cylinder. Such a unit is called a Flettner rotor, after Anton Flettner, who in 1924 utilized rotors of this type to drive a boat; his rotors were driven electrically and operated in a vertical plane.

The Magnus Effect is shown in Fig. 1. (It is named after its discoverer, Heinrich Gustave Magnus, a brilliant German physicist who died in 1870.) When air in motion strikes a revolving cylinder, thrust is produced at 90° from impingement in the direction of the cylinder's rotation. Picture it this way: as the airstream strikes the spinning cylinder, it is accelerated rearward and down. Air is both elastic and sticky. It tends to hang to the drum as it rotates and the drum, in throwing it off, produces a reaction which moves it upward. Lift is also produced by the deflection of air from the advancing lower half of the cylinder, or drum. What the rotor actually does, then, is to kid the air into believing it is flowing over a cambered airfoil section, which in a relative sense it is. But a very interesting angle crops out here in that the relative camber is *variable* to the rotational speed of the rotor and the forward speed of the plane. (Ah, interested? Here is that variable camber wing we've been dreaming of all these years!)

The effects of this remarkable lift-inducing rotation are surprising and easy to demonstrate. Make a small tube of balsa sheet or stiff paper—it works better if you seal the ends—about 6 or 8" long. Hold it in the palm of your hand and whip it off in such fashion as to set it spinning rapidly. After a couple of tries, you'll have no trouble in making it zoom to the ceiling with little effort.

Rotorplanes should be divided into two types: those in which the rotors spin freely and those in which the rotors are powered, the true Flettner rotors. Neither of these, by the way, should be confused with a machine of similar appearance, called the cyclo-giro, as this is really a lateral axis helicopter.

Now, with nonpowered rotors it is possible to produce lift by rotating them in the wrong direction, paradoxical as this may seem. Frankly, I have no theory for it, except to say that the lift produced seems to be a sort of parachuting effect



Two Flettner rotors might provide sufficient lift for a lightplane such as this

ROTORPLANES

for the experimentally-minded builder

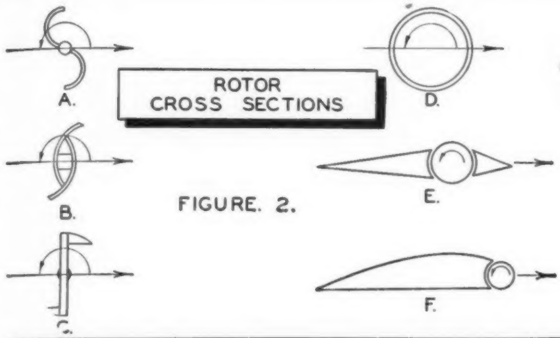
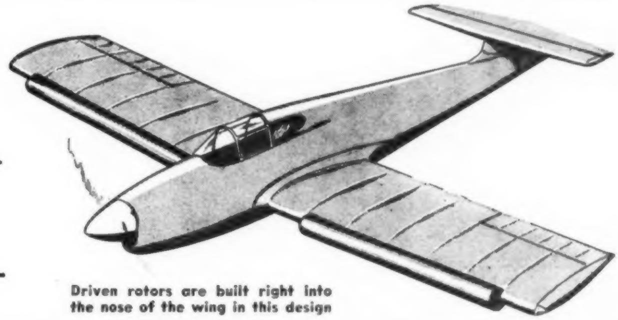


FIGURE. 2.



Driven rotors are built right into the nose of the wing in this design

coupled with the alternate flats of the rotor (to work this way the rotor must be similar to B in Fig. 2), which for some reason seem to produce more lift when they are flat fore and aft than they do drag when flat to the airstream. Although they will lift after this fashion there is a decided tendency for slight gusts to reverse the direction of rotation in flight, which seems to have little effect upon performance except to improve it. (Perhaps this will clear up some of the confusion expressed by Norman Kossuth and others upon my reference to lateral axis autogiros in the autogiro theory article —Jan. 48, M.A.N.

Some basic types of rotor cross sections, three auto-rotating and three applications for power, are shown in Fig. 2. Of the three free spinners, A is the best lifter, B is the strongest, and C is the simplest, good for quickies whacked out to test mass distributions. Powered rotors, cylindrical as in D, may be integrated into wing structures as in E and F.

Just what sort of tips should be used on rotors is a subject that will bear a bit of investigating. A simple disk has many structural advantages, and it seems that it keeps lift from spilling off the ends, but this may be purely personal prejudice. It is quite possible that cones would serve as well, or perhaps the entire rotor could be in the shape of a cone, providing a degree of dihedral to steady the plane in flight, if felt necessary by the experimenter. In any case, where the rotor is supported outboard by a strut, or by part of a wing structure, it is a fairly simple matter to include aileron control.

One of the great problems of rotor ship design is lateral stability, particularly under conditions of bank and turn. A number of factors enter the picture here, but the most important is our old acquaintance, gyroscopic effect.

In helicopter and autogiro practice we can get rid of gyroscopic troubles by making the rotor flexible enough to take a considerable progressive deflection or fairly violent bounces without transmitting the impulse to the fuselage. (For autogiros, a flexible rotor mast such as used on *rotorwing* is extremely effective.) With a drum rotor however, we run into further difficulties. Here the apparent disk, or perhaps we should say the apparent or real *cylinder* of the spinning rotor cannot be made flexible, nor would it help much if it could be.

When a rotorplane is flying straight and level, or climbing or descending, the gyroscopic forces generated in the rotors are sufficiently undisturbed to cause no undue difficulties—all other things being equal. But let's send one up in a turn and see what happens. Viewing the ship from its right we see that the rotor is spinning in a counterclockwise direction. Suppose we wish to turn to the right, this presupposes a bank, a raising of the left rotor and a lowering of the right. What happens?

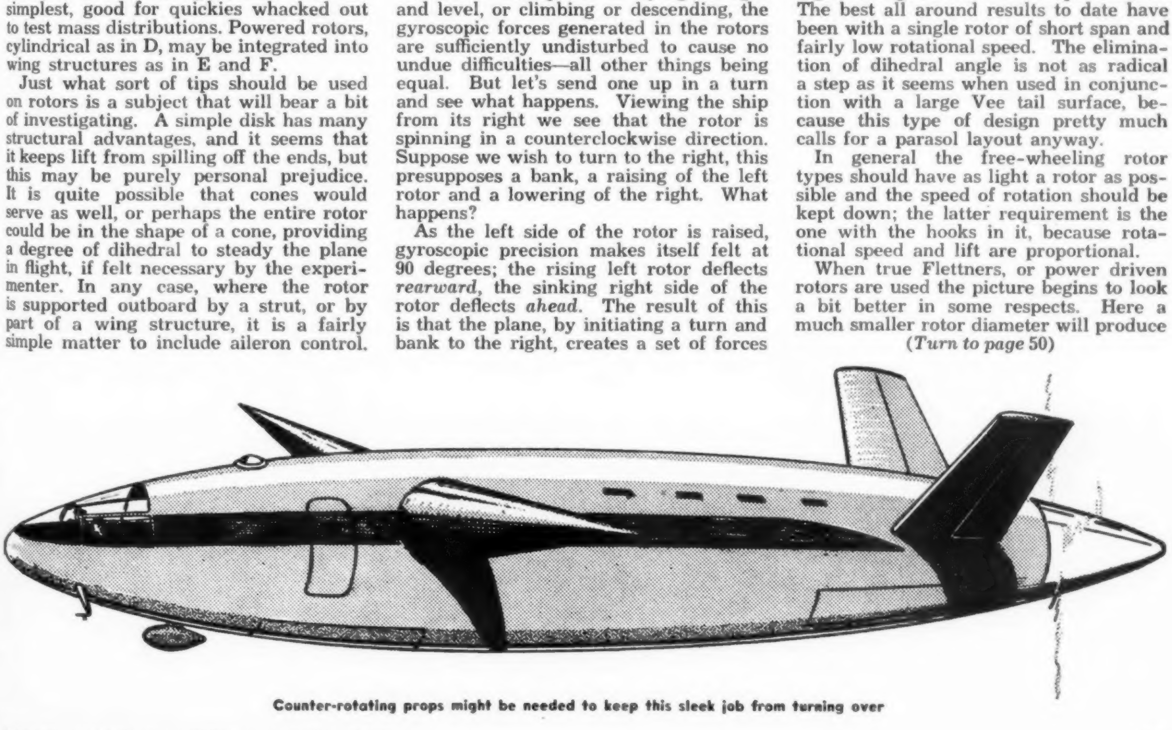
As the left side of the rotor is raised, gyroscopic precision makes itself felt at 90 degrees; the rising left rotor deflects *rearward*, the sinking right side of the rotor deflects *ahead*. The result of this is that the plane, by initiating a turn and bank to the right, creates a set of forces strongly resisting a right turn, usually so strong as to induce an actual yaw to the left. And this is the worst kind of yaw for it is done with the right "wing" down, which results in an awkward stall or a clumsy snap roll. Exactly the same thing happens in a left hand pattern when a left turn is attempted.

Using twin rotors with a dihedral angle between them seems to help a little, but not as much as it should by analogy to fixed wing practice. From the models I have built, I have found that if twin rotors are used they must be coupled together with a light wire universal joint so that one does not outrace the other, and this is just to maintain straight and level flight. In conditions of turn a dihedralled set of rotors without intercoupling seems hopeless. When connected together a gentle turn seems permissible. The best all around results to date have been with a single rotor of short span and fairly low rotational speed. The elimination of dihedral angle is not as radical a step as it seems when used in conjunction with a large Vee tail surface, because this type of design pretty much calls for a parasol layout anyway.

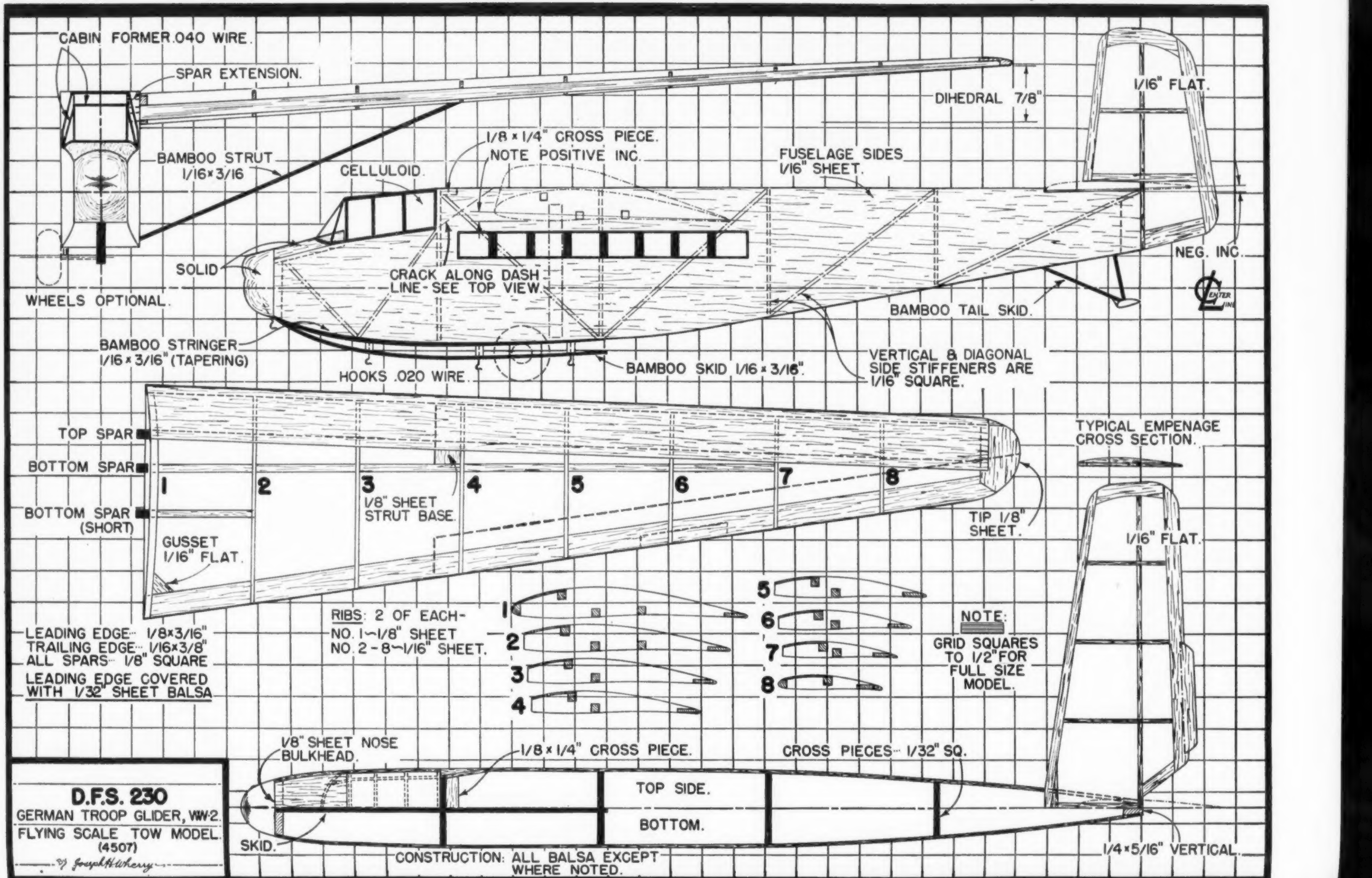
In general the free-wheeling rotor types should have as light a rotor as possible and the speed of rotation should be kept down; the latter requirement is the one with the hooks in it, because rotational speed and lift are proportional.

When true Flettners, or power driven rotors are used the picture begins to look a bit better in some respects. Here a much smaller rotor diameter will produce

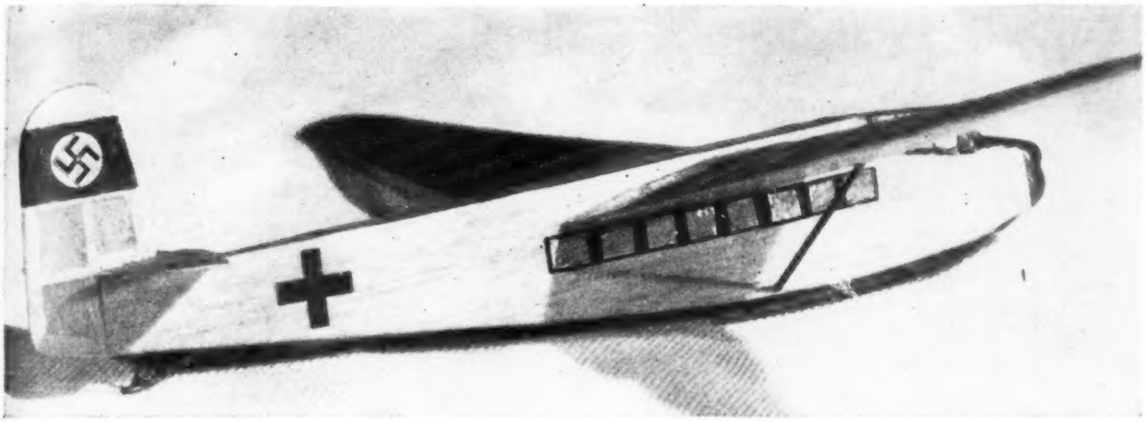
(*Turn to page* 50)



Counter-rotating props might be needed to keep this sleek job from turning over



D.F.S. 230
GERMAN TROOP GLIDER, WW-2.
FLYING SCALE TOW MODEL.
(4507)
by Joseph H. Wherry
CABIN FORMER .040 WIRE.
SPAR EXTENSION.
BAMBOO STRUT 1/16×3/16
WHEELS OPTIONAL.
SOLID
CELLULOID.
1/8×1/4" CROSS PIECE.
NOTE POSITIVE INC.
CRACK ALONG DASH LINE - SEE TOP VIEW.
FUSELAGE SIDES 1/16" SHEET.
DIHEDRAL 7/8"
1/16" FLAT.
NEG. INC.
CENTER LINE
BAMBOO TAIL SKID.
BAMBOO STRINGER 1/16×3/16" (TAPERING)
HOOKS .020 WIRE.
BAMBOO SKID 1/16×3/16".
VERTICAL & DIAGONAL SIDE STIFFENERS ARE 1/16" SQUARE.
TOP SPAR
BOTTOM SPAR
BOTTOM SPAR (SHORT)
1
2
3
4
5
6
7
8
1/8" SHEET STRUT BASE.
GUSSET 1/16" FLAT.
TIP 1/8" SHEET.
TYPICAL EMPENAGE CROSS SECTION.
1/16" FLAT.
LEADING EDGE... 1/8×3/16"
TRAILING EDGE... 1/16×3/8"
ALL SPARS... 1/8" SQUARE
LEADING EDGE COVERED WITH 1/32" SHEET BALSA
RIBS: 2 OF EACH-
NO. 1 - 1/8" SHEET
NO. 2 - 8 - 1/16" SHEET.
NOTE:
GRID SQUARES TO 1/2" FOR FULL SIZE MODEL.
1/8" SHEET NOSE BULKHEAD.
1/8×1/4" CROSS PIECE.
CROSS PIECES... 1/32" SQ.
TOP SIDE.
BOTTOM.
SKID.
CONSTRUCTION: ALL BALSA EXCEPT WHERE NOTED.
1/4×5/16" VERTICAL.



Scale Towliner

by Joseph H. Wherry

MOTORLESS aircraft, troop and cargo-carrying gliders were active on nearly all fronts during the recent war. The Allied gliders like the USAAF's CG-4A and the British *Horsa* types did much valuable work during the invasions of Burma and the landings in western and southern Europe. Even before these actions, however, German glider units were extremely active in the invasions of Crete, etc. These stories are so well known, that they are mentioned only as background for this article on the construction of a towline model of the most used German military glider, the D.F.S. 230.

Our model of this ship is an accurate scale reproduction capable of excellent flights. The landing gear has been eliminated. As a matter of fact, the gear on the big glider was really a take-off gear only; it was dropped from the plane immediately after its towed take-off. The model is exceptionally simple to build; only a few evenings are required to finish this ship and have it ready for flying. The author likes his models to be tough and able to absorb punishment without need of constant repairs.

If you have never built a scale towline glider, try this one; it will fly with the best of them. Moreover, this is a model of a glider that really made a name for itself.

The real D.F.S. 230 carried ten fully armed infantrymen or their equivalent in cargo weight. Some carried light field guns and crew while others supplied front line troops with food and materials. Our model's scale lines have been changed only around the tail group; it was advisable to slightly increase the area of the horizontal tail plane for greater efficiency. Otherwise, the model is a faithful reproduction. It should be a unique addition to your collection of flying scale models. Enterprising modelers might even fly the D.F.S. 230 on tow behind small controline gas models. That's an idea and here is the very model to help win that novelty or stunt trophy at your next meet.

Because of space restrictions, the plans are published in reduced size. Photostat or scale them up to full size by means of the grid; the grid squares will be 1/2" on the full size plan.

All dimensions are given full size for the model whose span will be 29"—large enough for good flights, yet small enough to make transportation easy.

Follow these instructions (parts dimensions are omitted from the text, as the plans should be frequently consulted) and you will have a model that will be a beauty on exhibition or in actual flight.

FUSELAGE. Cut two sides from 1/16" sheet stock of the best quality; medium weight balsa is best. Do not cut out the cabin windows as these are later added with tinfoil. Sand sides on both surfaces. Cement all the vertical and diagonal side stiffeners to the inside of each side. Check top and side views and cut a 1/8" nose bulkhead as shown. Also cut the vertical piece which joins the fuselage sides together at the tail. Cement the sides together at the tail and work forward connecting the sides with the cross pieces. Note the larger cross piece at the rear of the pilot cockpit. Finally cement the nose bulkhead in place. Then the upper solid block and the streamlining block may be added to the nose; carve to shape and sand after they have securely dried in place.

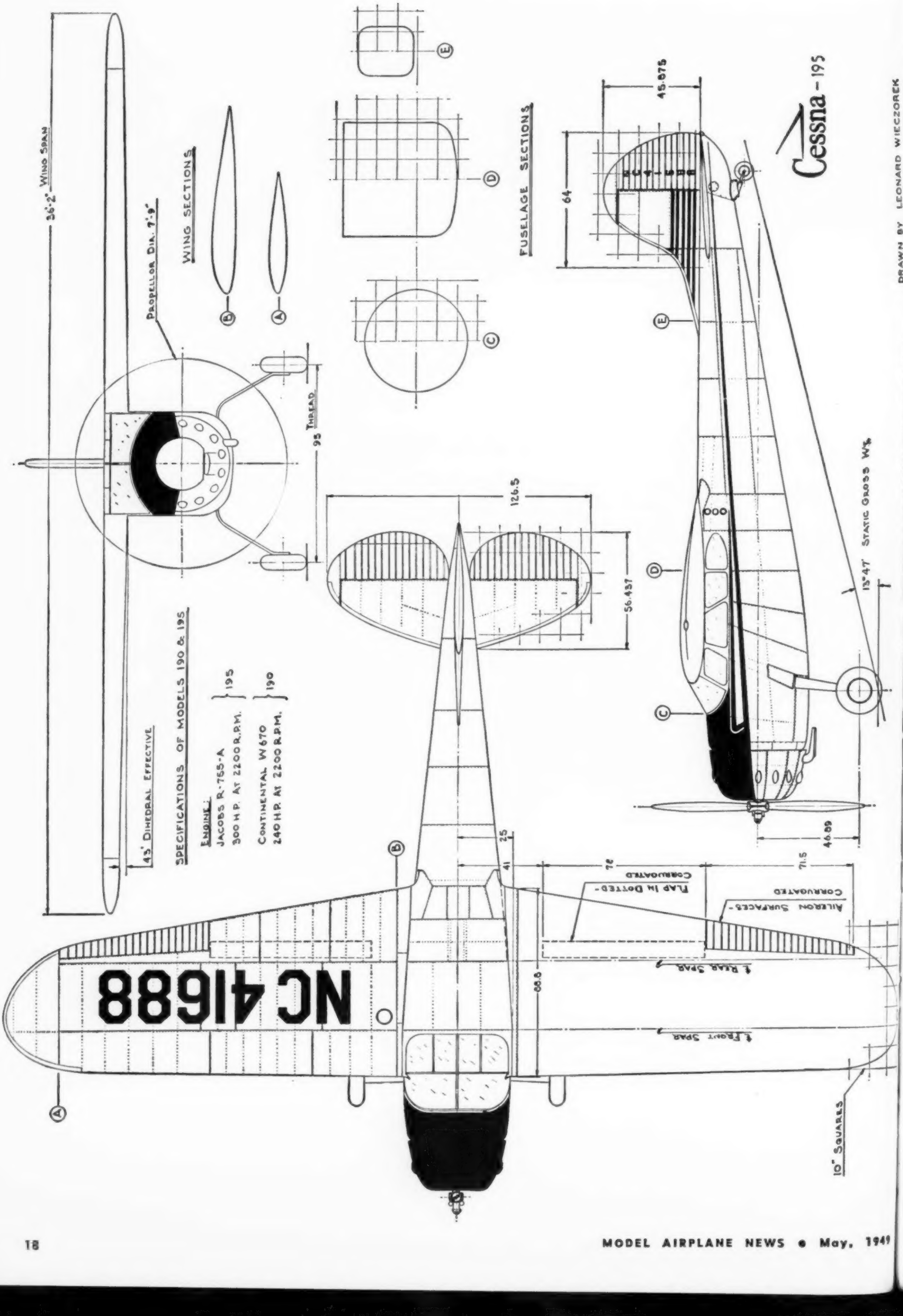
Notice that a bamboo stringer is centered on the bottom of the fuselage; this piece runs back and connects to the second large cross piece and provides the base to which the skid supports are attached. This bamboo stringer is sanded to the tapering side view indicated.

Omit the pilot cockpit cabin at this time; also the Skid.

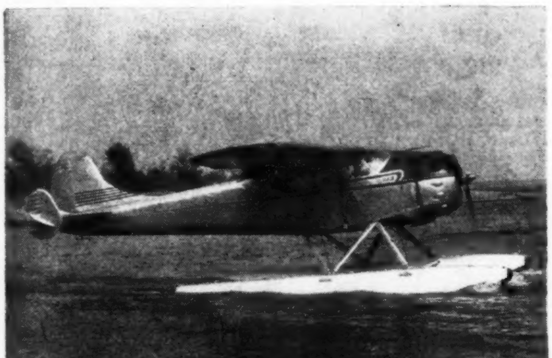
Cut out the three 1/8" sq. holes for the protruding wing spars on each side of the fuselage. Do an accurate job at this point and the wings will automatically have the correct positive incidence when they are later attached. Fuselage covering is done later, except for the sides; cover these with khaki tissue at this time.

WINGS. Trace a left wing panel, invert your tracing, retrace through and you will then have plans for each panel. Build the wings directly over the plans which have first been covered with a piece of wax paper to prevent the cement from adhering. Make two of each rib, noting that No. 1 ribs are heavier than are all others. Also note that the rearmost spar is a short one which aids in establishing the correct angle of incidence when the wings are later attached. The leading edge of the wings is covered with 1/32" sheet balsa back to the top/forward spar. The spars protrude slightly beyond the roots of the wing panels as shown. Do not omit the small gusset (at the root ribs) or the

(*Turn to page* 52)


Cessna-195
DRAWN BY LEONARD WIECZOREK
WING SPAN
36'-2"
PROPELLOR DIA. 7'-9"
WING SECTIONS
FUSELAGE SECTIONS
SPECIFICATIONS OF MODELS 190 & 195
ENGINE:
JACOBS R-755-A
300 H.P. AT 2200 R.P.M. 195
CONTINENTAL W670
240 H.P. AT 2200 R.P.M. 190
4.5° DIHEDRAL EFFECTIVE
THREAD
95
126.5
56.437
45.875
64
46.09
NC41688
FLAP IN DOTTED
CORRUGATED
AILERON SURFACES
CORRUGATED
℄ REAR SPAR
℄ FRONT SPAR
13°47' STATIC GROSS WT.
10" SQUARES

Cessna 195



ROBERT McLARREN

BOB McLARREN, an old friend to M.A.N. readers, started his aviation writing career in 1935 in our pages. He readily admits a 1932 copy of M. A. N. started him in aviation! After various feature articles and drawings, he settled down to "Plane on the Cover" in 1938 and it has been published continuously ever since. Continued articles until 1943 when he became M. A. N. Editor. Authored popular series "America's Warplanes" and edited other Air Age publications until 1945 when he left for Wash., D.C., and government service. Bob received his aero engineering education at Calif.; was engineer with Douglas, North American, Vultee, and Northrop companies before joining us in N. Y. Later headed a research analysis group with the NACA. Now an engineering writer but spends most of his time trying to raise corn, wheat, stock and a son on his Maryland farm.

by Robert McLarren

THROUGH the years we have grown accustomed to thinking of the civil airplane and the military airplane as two entirely different breeds of cat. The civil airplane has always seemed to be lighter, slower, simpler and not nearly as strong as the powerful, fast, heavily-built military airplane. In the extreme case, that of the jet bomber or fighter, this difference is assuredly present; actually, the difference is much greater than most of us suspect.

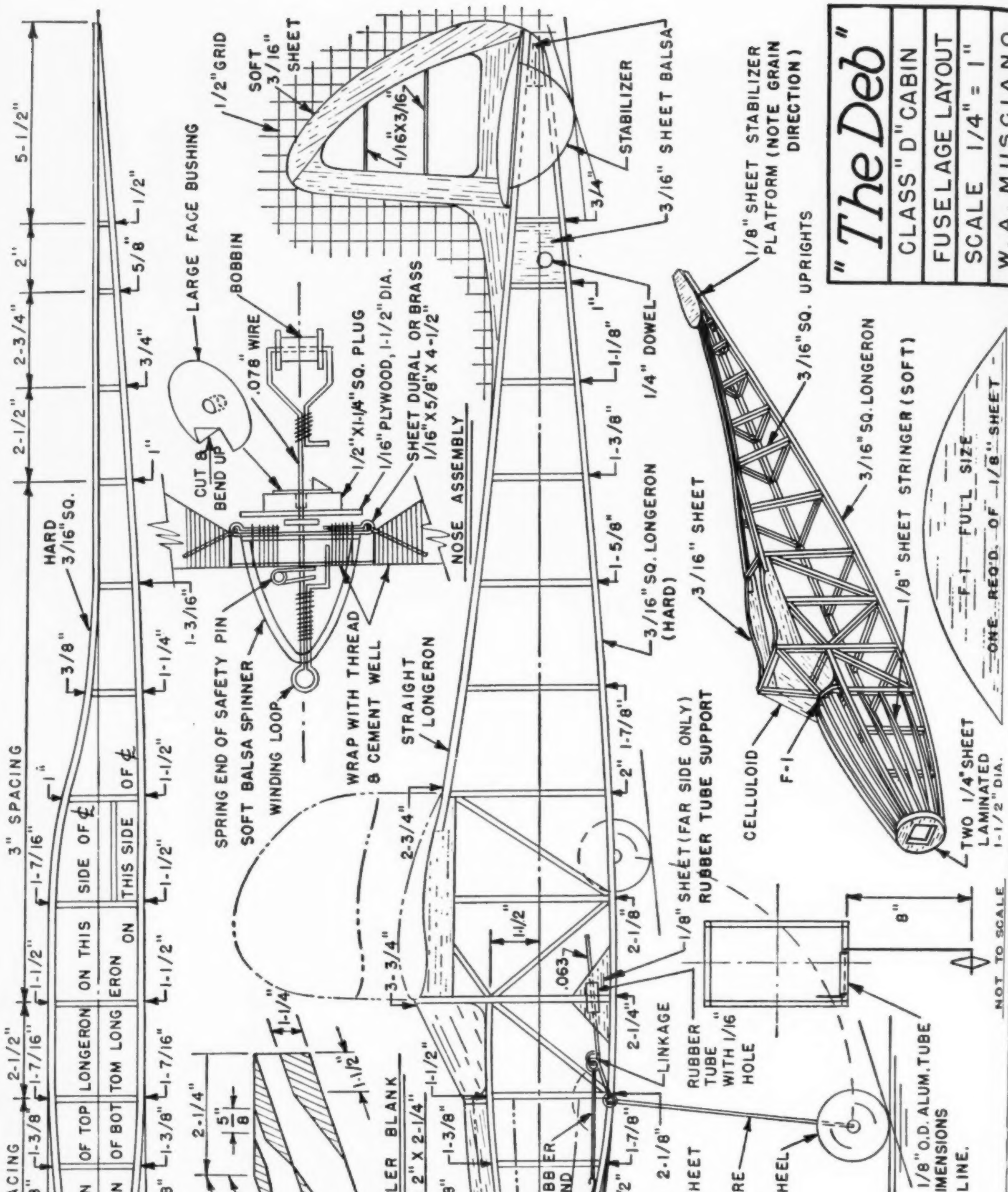
That difference is due to the specific requirements of the job. We certainly don't want a thin steel tube fuselage fabric covered for 600 mph speed in the stratosphere. Nor do we need a heavy, thick wing skin strongly reinforced for flying one of our friends around the airport on Sunday morning. And so airplanes are the result of the job required of them.

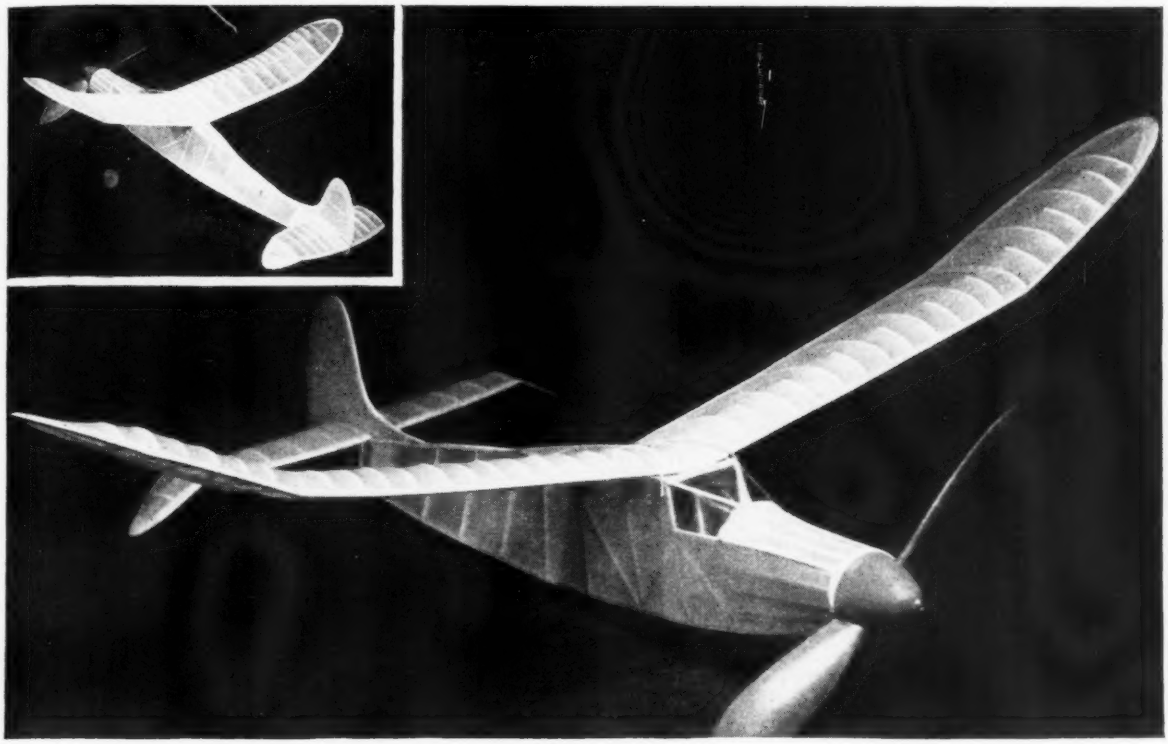
But did you know that frequently the jet-powered, 21-ton-bomb-dropping U. S. Air Force has requirements for one of our "lowly" civil airplanes, even for the personal aircraft type? World War II proved, beyond a shadow of a doubt, that the familiar "Grasshopper" type personal airplanes were far from lowly when it came to carrying out their assigned mission: any and everything not involving aerial combat (and they were even known to do that, on occasion!) Ferry a General here, carry a vital report there, bring medicine to a field hospital here, drop supplies to an inaccessible scout party there. With ordinary personal aircraft performing invaluable jobs like that, it can no longer be said that the civil and military airplanes are two different breeds: they're one and the same when the mission calls for their particular qualities.

The years since V-J Day put an end to another myth regarding the military personal aircraft: that it was a wartime stop-gap measure that the peacetime service would not require. One of the few aircraft types that continued in production, almost without a pause, after the drastic cancellations following V-J Day, was the liaison airplane. Aeronca Aircraft Corp. has received contracts for 613 *Champion* two-placers. North American delivered 133 *Navion* four-placers before selling its design to Ryan, which is now at work delivering 163 more of the type. Oddly, enough, however, these airplanes are *not* for the Air Force, which arranged for their purchase! Actually, these deliveries are going to the Army Ground Forces and to the National Guard for use in the myriad jobs they can perform with these branches of the armed services. Many of them have gone overseas to aid in liaison work with the occupation forces. But the latest personal aircraft to join the military parade *is* intended for the Air Force. Identified by the swank designation LC-126A-CE, underneath it all it's just our old friend the Cessna 195, our Plane of the Month.

Aviation pioneering in the U. S. was not alone the efforts of the Wright Brothers, Glenn Curtiss, and Glenn L. Martin. True, they are the famed leaders of those early years when every flight was a defiance of death and when just "flying" was considered a scientific miracle, with no thought ever given to how far, or fast, or high. However, it took a lot of other unsung pioneers to build the foundation for U. S. Air Power, pioneers who were neither "first" nor "famed" but simply there doing a job before most of us were even born.

(*Turn to page* 49)


"The Deb"
CLASS "D" CABIN
FUSELAGE LAYOUT
SCALE 1/4" = 1"
W. A. MUSCIANO
1/2" GRID
SOFT 3/16" SHEET
1/16X3/16
STABILIZER
3/16" SHEET BALSA
1/4" DOWEL
LARGE FACE BUSHING
BOBBIN
.078 WIRE
CUT & BEND UP
1/2"X1-1/4" SQ. PLUG
1/16" PLYWOOD, 1-1/2" DIA.
SHEET DURAL OR BRASS 1/16"X5/8"X4-1/2"
NOSE ASSEMBLY
SPRING END OF SAFETY PIN
SOFT BALSA SPINNER
WINDING LOOP
WRAP WITH THREAD & CEMENT WELL
STRAIGHT LONGERON
3/16" SQ. LONGERON (HARD)
HARD 3/16" SQ.
2" SPACING
3" SPACING
PLAN OF TOP LONGERON ON THIS SIDE OF ℄
PLAN OF BOTTOM LONGERON ON THIS SIDE OF ℄
1/8" SHEET
PROPELLER BLANK
20" X 2" X 2-1/4"
1/8" SHEET (FAR SIDE ONLY)
RUBBER TUBE SUPPORT
LINKAGE
RUBBER BAND
RUBBER TUBE WITH 1/16" HOLE
.063 WIRE
2" DIA. WHEEL BALSA
1/8" O.D. ALUM. TUBE
NOT TO SCALE
NOTE: ALL FUSELAGE DIMENSIONS ARE TO THE CENTERLINE.
1/8" SHEET STABILIZER PLATFORM (NOTE GRAIN DIRECTION)
3/16" SQ. UPRIGHTS
3/16" SQ. LONGERON
1/8" SHEET STRINGER (SOFT)
3/16" SHEET
CELLULOID
F-1
TWO 1/4" SHEET LAMINATED 1-1/2" DIA.
F-1 FULL SIZE
ONE REQ'D. OF 1/8" SHEET



THE DEB

by Walter Musciano

HERE is a rubber-powered flying model that should attract beginner and expert alike. As a contest winner it has proven itself a reliable high-performance craft, even under the worst weather conditions. The retractable landing gear and anhedral stabilizer are two features not normally found on the average model plane. The reason for the landing gear design should be obvious, but the anhedral in the stabilizer may not be so. When an airplane circles it banks, and although the wing dihedral tends to correct this, the plane has a tendency to dive and gradually work into a spin. With the application of anhedral, the tail tends to bank the plane even further and thus the tail drops and raises the nose preventing a spiral dive. The anhedral also keeps the plane upright when on the ground by providing two suspension points in addition to the mono-wheel.

The model has a slow-wheeling glide not unlike the flight of a buzzard. An airfoil, the G-8, developed by C. H. Grant for models, was used with great success.

Wing, stabilizer, and fin construction are quite elementary. First the spar is assembled to the correct dihedral (or anhedral) angle and while drying, the ribs are cut out and pinned to each other. Sand these while pinned together, in order to insure a uniform camber throughout the wing. When the spar is dry, the ribs are slipped onto the spar to the proper location, and the trailing edge which has been notched is put in place. The units are then cemented together. The addition of the leading edge, false ribs, and tips completes the frame. After sanding the surfaces well, these may be covered with tissue, preferably red because this color remains in sight longer than any other. Three coats of clear dope should create a good finish. Trim may be added with tissue or colored dope, but the latter should be applied sparingly in order to avoid the addition of unnecessary weight.

A few words on the fuselage construction may be helpful to the inexperienced builder. Naturally before construction begins the plans must be enlarged four times by photostating or by following the dimensions given on the plans to draw the plan on a large sheet. Two-side frames are made in the conventional manner using the hardest balsa available; and while they are being assembled with the cross braces, the top longerons of the fuselage may be brought together gradually and cemented. It will be noted on the plan that the top longeron is marked "straight longeron," yet it appears on the drawings as a curved longeron. The reason is that after the longerons are united, they will form a curve automatically. When all the cross braces have been cemented in place, the two 1/4" sheet nose pieces are added together with the twelve 1/8" sheet stringers. Add the 1/8" sheet stabilizer platform and make sure the grain runs spanwise; also check to make sure the stabilizer is set at 3/16" positive incidence.

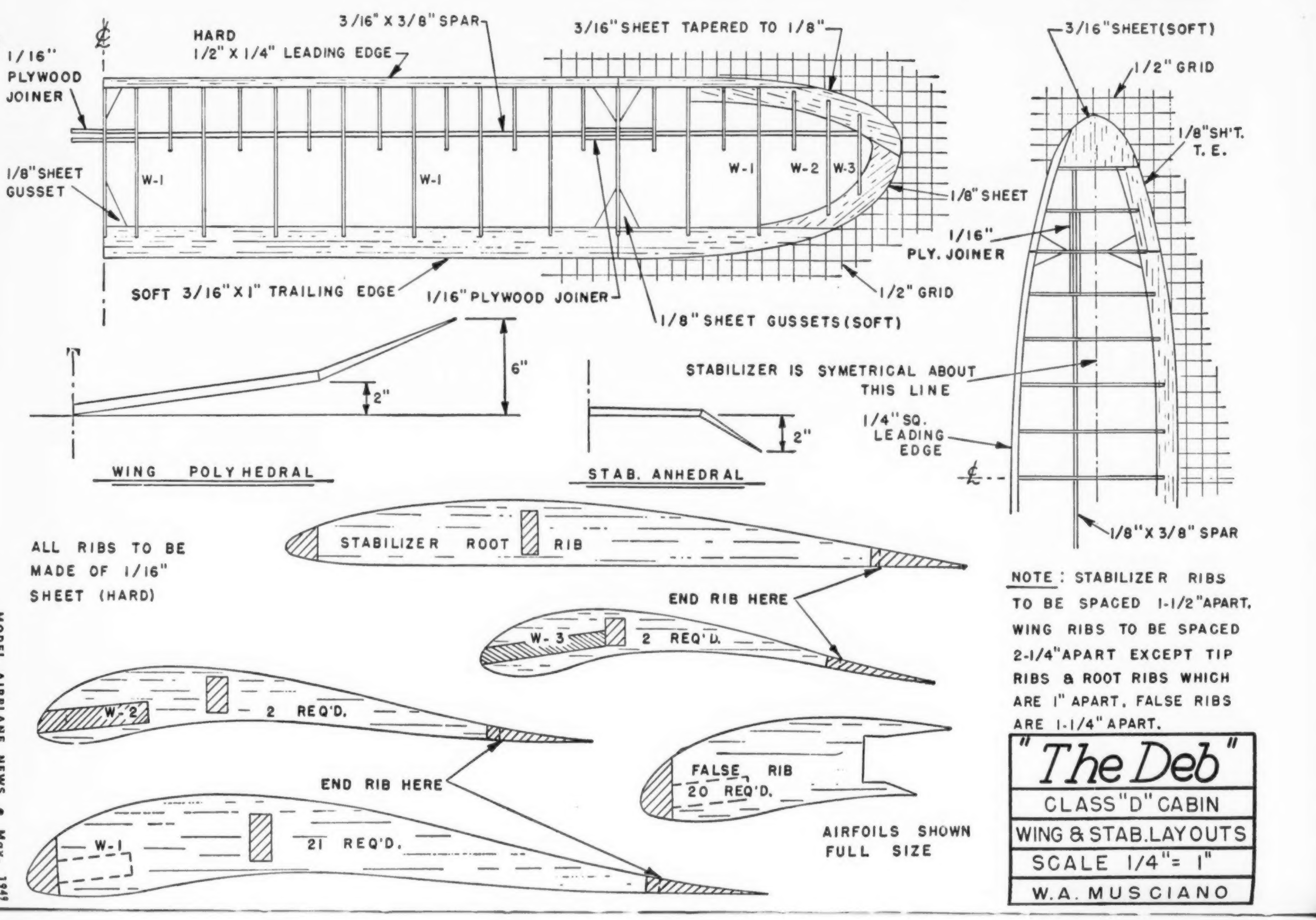
The landing gear may be added at this time. It has been designed so it will retract slowly giving the model a chance to leave the ground before it snaps up, unlike the gear on most designs. Total elapsed time allowed for complete retraction should be about five to seven seconds. The rubber band used in retraction should be 1/16" square.

When the fuselage frame is completed, it should be sandpapered thoroughly, the celluloid cabin added, and then covered with silkspan. The original had five coats of clear dope. The small dorsal fin is cemented to the fuselage and the remainder of the fin is attached to the stabilizer.

A two-bladed propeller was used because there was no fear of cavitation, as the shaft rpm was not excessive. Quarter sawed, medium hard balsa should be used. The propeller should be carved in one piece and after the folding mechanism has been installed, it can be cut along the fold line. The propeller spinner is made of a soft balsa block, hollowed to allow free movement of the rubber tensioner. Several coats of dope should be applied to the propeller blades with intermittent sandings until a glass-like surface is obtained, thus increasing the efficiency. The large face bushing on the back of the nose piece should be well cemented. If a bushing of this type cannot be found, a wood screw will act as a stop. Power used was twenty-four strands of 1/4" flat brown rubber, well lubricated, with 14 inches of slack. If the model is underweight, addition of rubber power rather than lead shot or clay is recommended; slack should be added in proportion.

The model balances 3/4 of the chord behind the leading edge of the wing. Powered flight should not be attempted until the glide proves satisfactory. The climb as well as the glide is to the left. It should be remembered that no two models fly alike so caution should be exercised in test flights. Good luck!

General dimensions are: *Span* 51-1/2"; *Chord* 6"; *Length O.A.* 38-3/4"; *Wing Area* 288 sq. in.; *Cross Section* 18 sq. in.; *Required Min. Wt.* 9 oz. (A.M.A. Rules.)


1/16" PLYWOOD JOINER
HARD 1/2" X 1/4" LEADING EDGE
3/16" X 3/8" SPAR
3/16" SHEET TAPERED TO 1/8"
1/8" SHEET GUSSET
W-1
W-1
W-1
W-2
W-3
1/8" SHEET
SOFT 3/16" X 1" TRAILING EDGE
1/16" PLYWOOD JOINER
1/8" SHEET GUSSETS (SOFT)
1/2" GRID
3/16" SHEET (SOFT)
1/2" GRID
1/8" SH'T. T. E.
1/16" PLY. JOINER
6"
2"
2"
STABILIZER IS SYMETRICAL ABOUT THIS LINE
1/4" SQ. LEADING EDGE
WING POLYHEDRAL
STAB. ANHEDRAL
1/8" X 3/8" SPAR
STABILIZER ROOT RIB
ALL RIBS TO BE MADE OF 1/16" SHEET (HARD)
END RIB HERE
W-3
2 REQ'D.
W-2
2 REQ'D.
FALSE RIB
20 REQ'D.
END RIB HERE
W-1
21 REQ'D.
AIRFOILS SHOWN FULL SIZE
NOTE: STABILIZER RIBS TO BE SPACED 1-1/2" APART. WING RIBS TO BE SPACED 2-1/4" APART EXCEPT TIP RIBS & ROOT RIBS WHICH ARE 1" APART. FALSE RIBS ARE 1-1/4" APART.
"The Deb"
CLASS "D" CABIN
WING & STAB. LAYOUTS
SCALE 1/4" = 1"
W.A. MUSCIANO

design forum

by Charles H. Grant

SINCE the early days of aviation, the "stall" has brought the greatest terror to aviators and engineers alike. It has been and is today the bugaboo of stability. Unquestionably it has been publicized beyond all other unstable airplane characteristics, and rightly so because it was responsible for nearly all early crashes in old Wright biplanes and for fatal crashes every year since that time. The problem of the stall and its disastrous results has never left us. All sorts of tricks, including washin, washout, innumerable arrangements of surfaces, changes in position of C.G. and size of tail surfaces, have been tried in order to eliminate it, yet without complete success.

But whoever started the idea that the *stall itself* was dangerous? Should we not say that the *results* of stalling under certain conditions of weight position and size of areas is the imporant fact? It is not the stall that kills you but the crash that results from *THE DIVE AFTER THE STALL.* Heretofore, we have assumed that a dive is the natural result of a stall and we have continued merrily upon this basis. Actually, this is not true. It has been demonstrated upon many occasions that an airplane can stall without a dive resulting. In these cases the airplane was so adjusted and the weights and areas were so distributed and proportioned, that the nose of the airplane would not drop into a dive position *before the plane recovered from the stall and normal flight speed was resumed.*

These comments have been prompted by Lawrence M. Berkley, of Ithaca, New York. He has observed the significance of the foregoing facts like thousands of other aero-scientists who have done much of their experimenting with models. However he has approached the problem from the practical viewpoint: he has observed that tandem aircraft fly with as much stability as the normal orthodox aircraft. Actually this is the answer to the whole problem, because if a tandem airplane is proportioned properly with its surfaces and wings arranged in a specific manner and its tail surfaces of a correct size, *a dive will not result from a stall.* If such a plane stalls, when it is properly adjusted, the nose will drop slowly and flight speed will be attained again *before* the plane assumes a diving position. This is true provided, of course, that it does not fall off to one side or the other; naturally a plane must be designed to be stable in this respect.

In order to understand the reason for this we must compare the reactions of tandem type aircraft with present orthodox types that have no lifting tail. Fig. 1. represents the orthodox airplane of today. You will note that the center of gravity is forward of the lift force on the wing and that there is a downward force acting on the tail. This represents force reactions in normal level flight. Fig. 2. shows the force setup of a tandem airplane. Here the C.G. is *to the rear* of the lift force on the wing and there is an *upward* or *lifting* force on the stabilizer during normal flight. The well-known twin pusher model is built on this principle. The famous and extremely stable *K.G.* (Kovel-Grant) gas model airplane designed and flown in 1933, also incorporated this principle.

Now let us see what happens when each of these types stalls. Fig. 3. shows the orthodox plane in stalling position. You will note that the lift force on the wing has moved slightly forward but that the pull of the C.G. is forward of the lift force. Instead of being a negative force, the stabilizer force is now positive, tending to lift the tail. In other words, we have a force T lifting the tail and the downward pull of gravity W, both creating counterclockwise moments about the point of lift force reaction, and both tend to nose the airplane sharply downward. In fact this setup, with the force W ahead of lift force L, noses the airplane downward into a sharp dive because of the counterclockwise couple WN. This is the result of the combined effect of the very large and sudden corrective moment WN, caused by W being forward of L and by the lifting force T on the stabilizer.

Now consider the tandem arrangement in a stall, Fig. 4. The corrective moment in this case results from a sharp increase in the lift on the stabilizer, *relative* to the increase in lift on the wing, and it is not produced by the couple between L and W. W. being *rearward* of L, does not nose the airplane over sharply into a dive, but instead has the effect of *gradually* decreasing the angle of stall as the airplane sinks, without producing such a sharp and sudden recovery from the stall that a dive results. As the whole airplane sinks under the downward pull of W, the counterclockwise moment TM due to force T on the stabilizer is larger than the clockwise moment LN about the C.G., because T has become proportionally greater than L with the increase in angle of attack to the stalling point. This greater increase of force T, relative to L, results from the *angle of incidence* of the stabilizer being less than the wing *angle of incidence.* Usually the difference is about 3°. If the stabilizer is set at 0°, or parallel to the thrust line, and it is a cambered

(*Turn to page* 46)

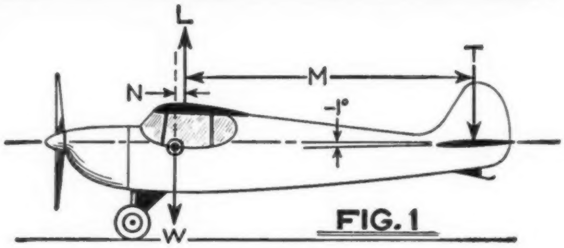


FIG. 1

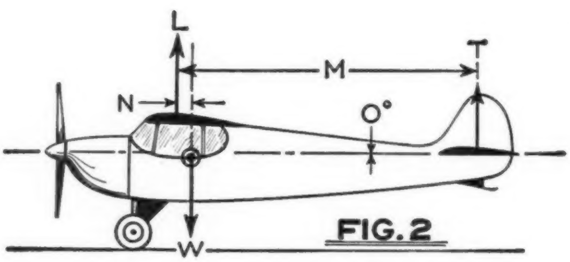


FIG. 2

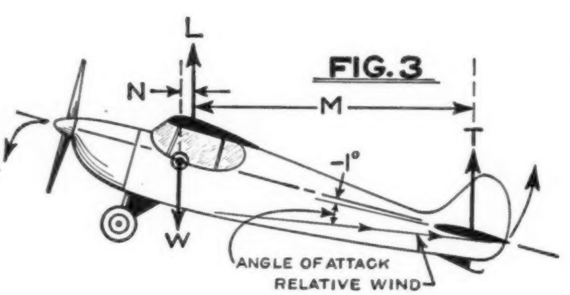


FIG. 3

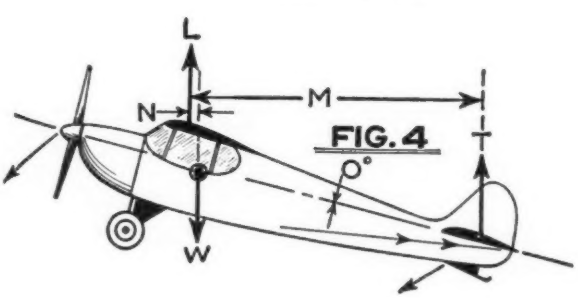


FIG. 4

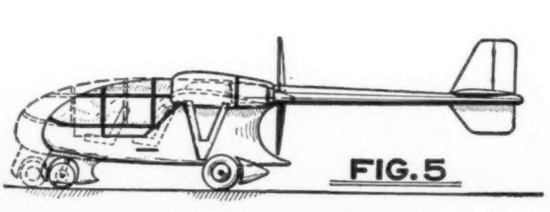
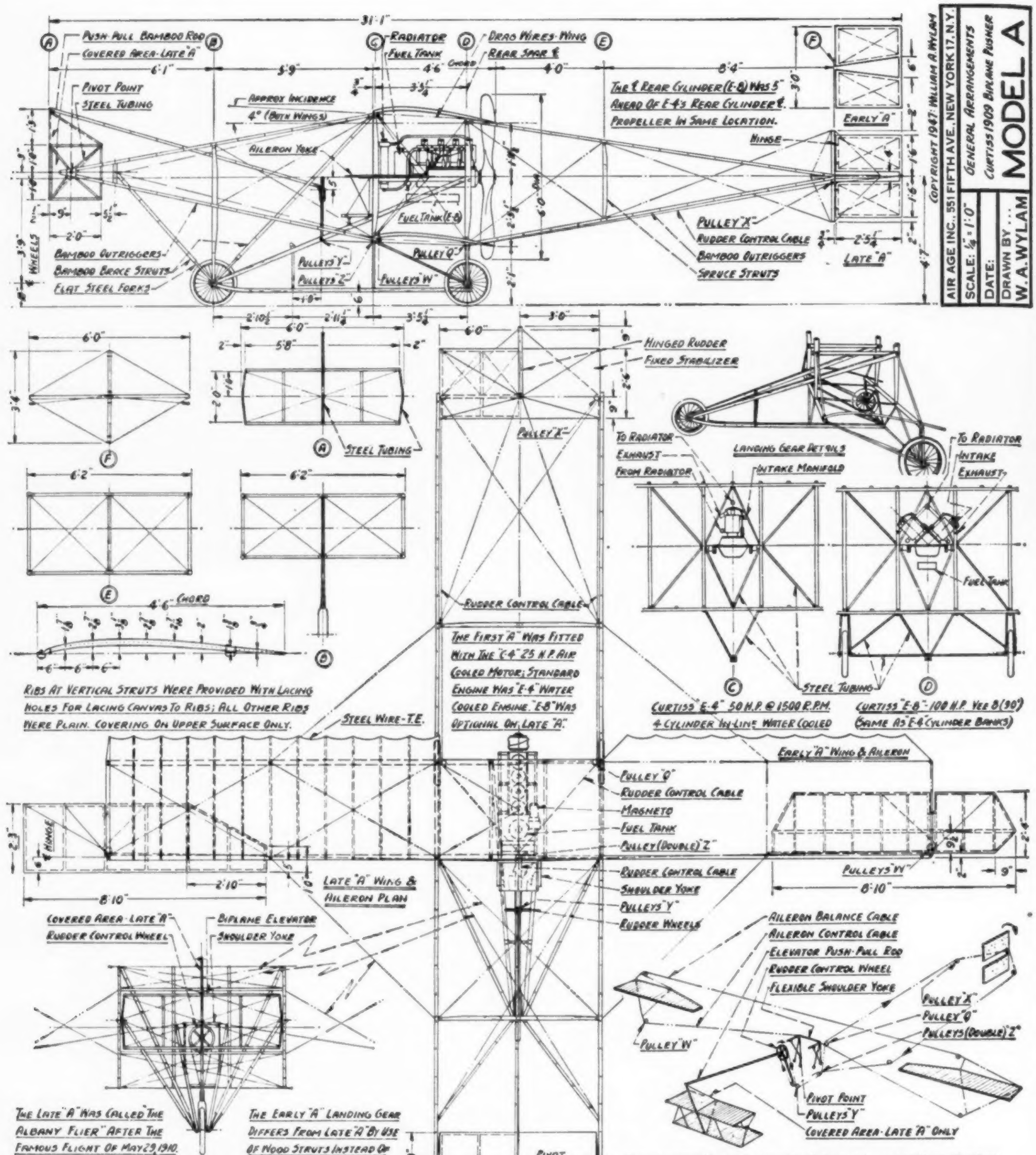
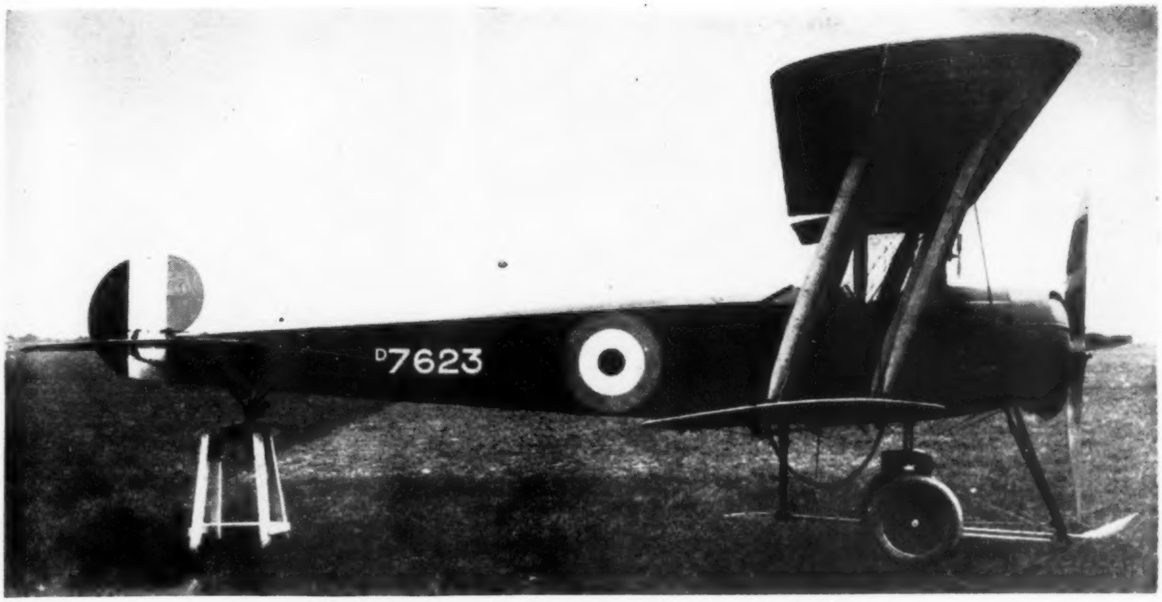


FIG. 5


AIR AGE INC., 551 FIFTH AVE., NEW YORK 17, N.Y.
COPYRIGHT 1947: WILLIAM A. WYLAM
GENERAL ARRANGEMENTS
CURTISS 1909 BIPLANE PUSHER
MODEL A
SCALE: 1/4" = 1'-0"
DATE:
DRAWN BY ... W. A. WYLAM
PUSH-PULL BAMBOO ROD
COVERED AREA-LATE "A"
PIVOT POINT
STEEL TUBING
APPROX INCIDENCE 4° (BOTH WINGS)
AILERON YOKE
RADIATOR
FUEL TANK
DRAG WIRES-WING
REAR SPAR
THE ℄ REAR CYLINDER (E-8) WAS 5" AHEAD OF E-4's REAR CYLINDER ℄. PROPELLER IN SAME LOCATION.
EARLY "A"
HINGE
LATE "A"
PULLEY "X"
RUDDER CONTROL CABLE
BAMBOO OUTRIGGERS
SPRUCE STRUTS
BAMBOO BRACE STRUTS
FLAT STEEL FORKS
WHEELS
PULLEYS "Y"
PULLEYS "Z"
PULLEYS "W"
PULLEY "Q"
FUEL TANK (E-8)
STEEL TUBING
HINGED RUDDER
FIXED STABILIZER
LANDING GEAR DETAILS
TO RADIATOR
EXHAUST
FROM RADIATOR
INTAKE MANIFOLD
INTAKE
FUEL TANK
STEEL TUBING
CURTISS "E-4" 50 H.P. @ 1500 R.P.M. 4-CYLINDER IN-LINE WATER COOLED
CURTISS "E-8" 100 H.P. VEE 8 (90°) (SAME AS E-4 CYLINDER BANKS)
RUDDER CONTROL CABLE
THE FIRST "A" WAS FITTED WITH THE "C-4" 25 H.P. AIR COOLED MOTOR; STANDARD ENGINE WAS "E-4" WATER COOLED ENGINE. "E-8" WAS OPTIONAL ON LATE "A".
RIBS AT VERTICAL STRUTS WERE PROVIDED WITH LACING HOLES FOR LACING CANVAS TO RIBS; ALL OTHER RIBS WERE PLAIN. COVERING ON UPPER SURFACE ONLY.
STEEL WIRE-T.E.
CHORD
EARLY "A" WING & AILERON
PULLEY "Q"
RUDDER CONTROL CABLE
MAGNETO
FUEL TANK
PULLEY (DOUBLE) "Z"
RUDDER CONTROL CABLE
SHOULDER YOKE
PULLEYS "Y"
RUDDER WHEELS
PULLEYS "W"
LATE "A" WING & AILERON PLAN
COVERED AREA-LATE "A"
RUDDER CONTROL WHEEL
BIPLANE ELEVATOR
SHOULDER YOKE
AILERON BALANCE CABLE
AILERON CONTROL CABLE
ELEVATOR PUSH-PULL ROD
RUDDER CONTROL WHEEL
FLEXIBLE SHOULDER YOKE
PULLEY "X"
PULLEY "Q"
PULLEYS (DOUBLE) "Z"
PULLEY "W"
PIVOT POINT
PULLEYS "Y"
COVERED AREA-LATE "A" ONLY
THE LATE "A" WAS CALLED "THE ALBANY FLIER" AFTER THE FAMOUS FLIGHT OF MAY 29, 1910.
THE EARLY "A" LANDING GEAR DIFFERS FROM LATE "A" BY USE OF WOOD STRUTS INSTEAD OF STEEL TUBING.
OUTRIGGER FRONT-VIEW
PIVOT
PILOT LEANED RIGHT OR LEFT ON FLEXIBLE SHOULDER YOKE; THIS YOKE WAS MOUNTED ON 8 PIVOTS (4 EACH SIDE). RUDDER TURNED SHIP TO LEFT WHEN THE WHEEL WAS TURNED CLOCKWISE.
PULLEY "W"
HINGE
HINGE
PULLEY "W"
RUDDER CONTROL CABLE
AILERON CONTROL CABLE
2-20" SPOKED WHEELS
1'-8" DIA.
ENTIRE AIRPLANE WAS OF NATURAL VARNISH FINISH. ALL METAL FITTINGS & TUBINGS WERE PAINTED ALUMINUM.
31'-1"
30'-0"
36'-0"



Protection afforded prop by the landing gear skid is apparent in this view

WORLD WAR I

PART 2

by Robert C. Hare

BESIDES the honors listed last month for the Avro 504 series, the excellence of this aircraft is borne out in the fact that it was constructed in greater numbers than any other World War I type of any class or by any nation. In all, 7,029 Avro 504's were constructed up to November 11, 1918; and while most of the number remaining at that time were sold to private fliers as surplus aircraft, additional models, further improvements on the basic design, were constructed in the post-war period well into the 1920's.

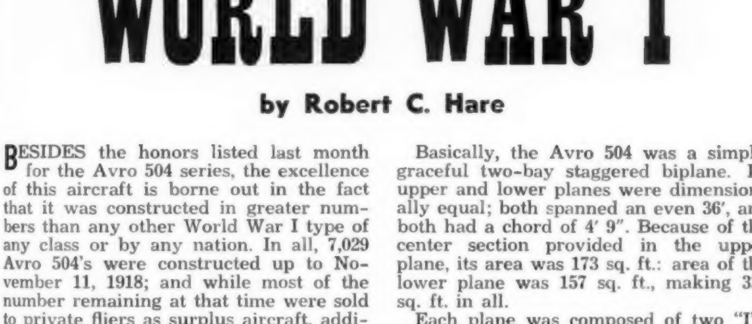
DESIGN

What then was the "secret of success" of this faithful trainer? We can best say, perhaps, that it was the basic simplicity of design, coupled with common sense aero-dynamics and experience. It was one of the few W. W. I types produced in large enough quanitties to permit engineers to work out all of the objectionable "bugs."

Basically, the Avro 504 was a simple, graceful two-bay staggered biplane. Its upper and lower planes were dimensionally equal; both spanned an even 36', and both had a chord of 4' 9". Because of the center section provided in the upper plane, its area was 173 sq. ft.: area of the lower plane was 157 sq. ft., making 330 sq. ft. in all.

Each plane was composed of two "I"-beamed spars connected by tubular compressions struts and steel wire ties as a basic structure. To this was added 20 ribs in each right- and left-hand panel, including tip and butt ribs. Inasmuch as research had not reached a standardized condition in those days, the airfoil section was one of Avro design with low upper and lower ordinates, giving it a shallowness typical of the period, and with a slight camber on the lower surface. Ribs themselves were built up of plywood webs glued and gusseted to the spars, with milled capstrips applied later. Spars, capstrips, and plywood webs were made of spruce, the latter laminated in three plys.

Avro 504K's being readied for use in wintry surroundings



Ailerons, fitted in both upper and lower wings, were also built of spruce, each member having nine ribs, including tip and butt ribs.

Cut-out of the upper wing over the fuselage was standardized as a semi-circle on all Avro 504 series models. Lower wing-to-fuselage attachment, however, was so arranged on early models to provide one rib separation between the fuselage and lower wing aft of the rear spar to increase downward visibility. In later models, the lower wing was butted against the fuselage, obscuring downward visibility for the occupant of the rear cockpit, in accordance with instruction procedures which recommended landing with eyes on the horizon.

The upper wing was attached to the center section by means of 1/4" bolts going through fittings on the front and rear spars. The center section itself was attached by means of four forward staggered struts mounted in steel sockets, bolted in turn to the upper longerons of the fuselage. Avro 504K erection instructions recommend that "The struts should be hammered well home in their sockets by means of a wooden mallet." What more need be said? . . . except that they were also bolted into place!

Lower wings were attached directly to lower longerons in the fuselage, again through stamped steel fittings. When trued up, the wings of the 504, on all models, were positively staggered at 24", with a gap of 5' 6". Dihedral on all models was 2-1/2° for both wings. Incidence of both wings on all models was nominally set at four degrees, but at the rear outer struts on models 504B, C, E, and F, (and in some instances on model G) this measurement was adjusted 2-1/32" from normal; on types 504A, D, and J, (and in some instances, K) it was 1-29/32" from normal. These rather precise adjustments were made with tension on the incidence wires and rear landing wires in the interplane bracing system.

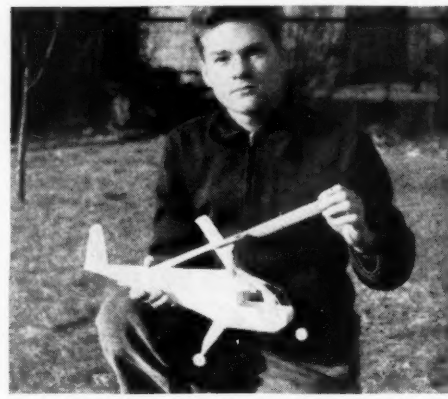
Fuselage of the 504K and its predeces-

(Turn to page 54)

No. 1 John Appi holds free flight scale *Spitfire;* radio control may be added later

No. 2 Six-foot glider with maker Johnny Deitch

No. 3 Les Mowbray had fine results with this M. A. N. design by Bill Winter



No. 4 Bruce Packham holds another M. A. N. design

AIR WAYS

News of Model Experimenters All Over the World

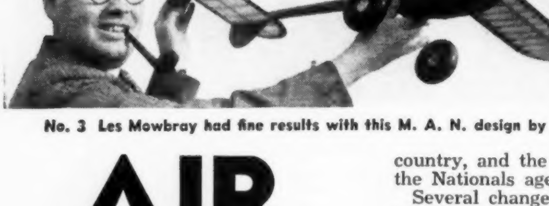
THE PAA-LOAD EVENT inaugurated last year at Olathe was so successful its sponsor, Pan American World Airways has scheduled 17 additional contests of the same sort for the coming season. These 17 events will be included in AMA-sanctioned contests all over the country, and the event will again be on the Nationals agenda.

Several changes in the rules this year make the event of interest to a much wider group of modelers. While the 1947 PAA-LOAD meet was restricted to Junior-Senior fliers in Class B only, Open contestants will have their own division this year, and models of both A and B classes will be included. Furthermore, to avoid confusion, flight rules for this event will be exactly the same as AMA rules for FF models of the same classes.

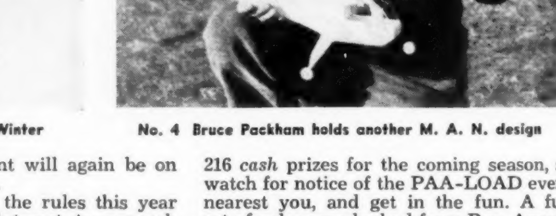
Experience at the '48 Nationals showed that quite conventional design was evident. The winner used a normal high-wing cabin ship; aside from the necessity of providing for the payload "occupants", and assuring yourself that the plane can ROG reliably (this is mandatory), most good free flight ships are possibilities for this sort of flying.

Pan-American has put up an array of 216 *cash* prizes for the coming season, so watch for notice of the PAA-LOAD event nearest you, and get in the fun. A full set of rules may be had from Pan-American World Airways, 28-19 Bridge Plaza North, Long Island City 1, N.Y.

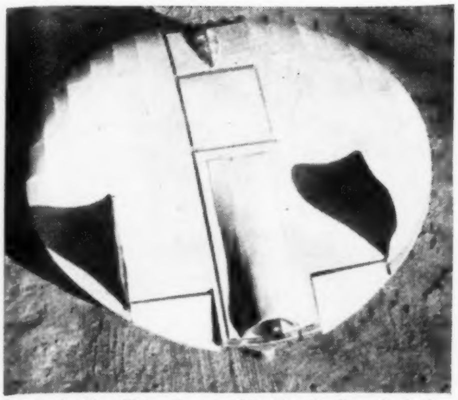
FLIGHT PLAN CONTEST. Many contest fliers, and those who would like to engage in contest work but refuse to do so under present restrictive rules, will be interested in a contest held by the Portland (Ore.) *Fireballs.* This was practically a "no rules" contest, in that the contestant himself decided what his model could do, then tried to follow the flight plan he had filed with the judges. About the only fixed restriction was that no control from ground was permitted, thus ruling out radio, sound, and U-control. Any motive power was permissible; the tiniest CO2 job could be pitted against the biggest D gassie. To show what maneuvers were expected, we list here a



No. 5 Caudron scale racer for controline built by Ivor Newman

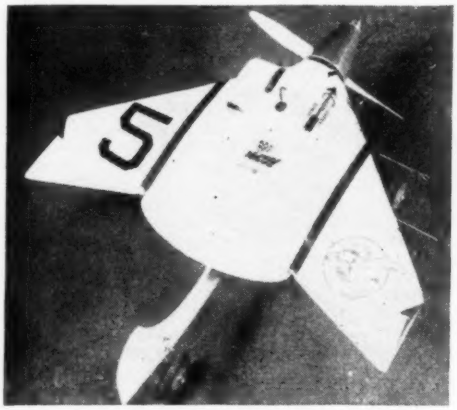


No. 6 Highly successful controliner built by A. Wilson, Jr.

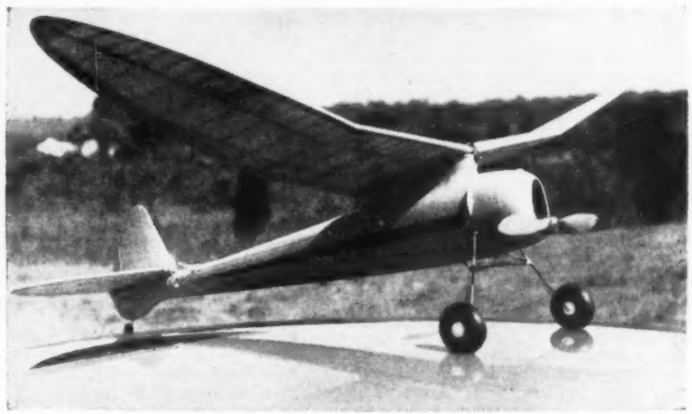


No. 7 Another *Flying Saucer*, this time by Francis Gruber

No. 8 Meet *One Lung Lulu* (the model), a radio controlled wing, held by Don Zawada



No. 9 Gordon Greenley's *Super Sonic* hit 72 mph



No. 10 Free flight design by Carl Hermes was lost on a thermal

complete tabulation of the scoring points:

1. Take-off—10 pts. for every second model is on ground after release.
2. Circles—(a) 10 pts. for each circle
   (b) 15 pts. if reversed after first 2 circles
   (c) Any circles over or under flight plan number will deduct 5 pts. each
3. Flight—(a) 2 pts. for every second in air
   (b) 1 pt. deducted for every second over or under stated time
4. Landing—(a) Spot landing is worth 100 pts.
   (b) 1 pt. deducted for every 5' from spot
   (c) Landing more than 500' from spot cancels all score

There were nine attempts allowed for three official flights, the highest score of the three to be used. ROG take-offs were specified, but it will be seen that the contestant could pick up a good number of points by the correct sort of take-off.

It is suggested that a P.A. system be employed to keep the spectators (and other contestants) advised of the flight plan of each flier as his turn comes up. This sort of event can be a real crowd pleaser, so keep the onlookers advised of what's happening.

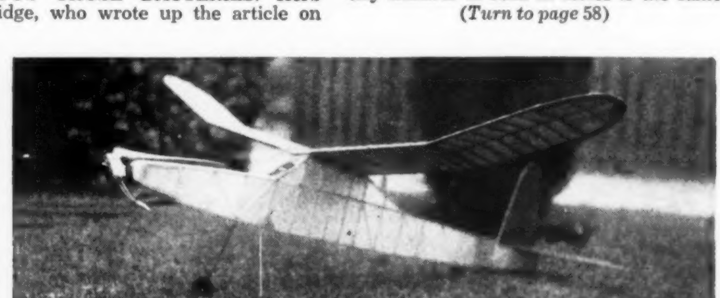
Here is the answer to those modelers who decry present-day contests and refuse to build "freaks" to enter them. Let's hear more reports of such contests. And keep your rules simple! It's tough enough just to make a ship take-off, turn a few circles and land at a designated spot, in a specified time, without adding needless complications!

ABOUT THOSE BATTERIES. Herb Owbridge, who wrote up the article on "charging" batteries in March '49 M. A. N., hastens to inform us that there were a couple of errors in the chart on page 36. Under the heading "Battery or Group" at the left of the table the word "parallel" in lines 2, 4, and 6 should read "series". In other words, all charging current rates are either for single cells, or cells connected in series. The reason is very simple. When connected in series, all of the charging current goes through each cell, whereas with a parallel connection, the charging current divides up between the cells. The charger specified can only produce about 300 ma., which is not enough if each cell takes 1/8 of it. The charger can produce plenty of voltage, however, so hook the cells in series, and each will receive the same current as read on the meter.

Since the charging current and time for any number of cells in series is the same

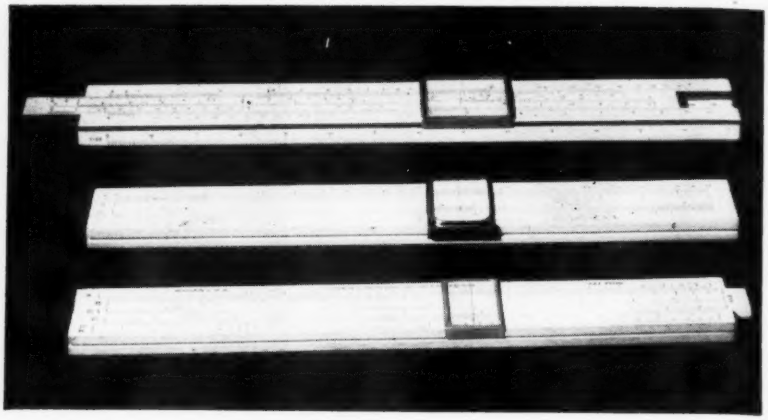
(*Turn to page* 58)

No. 11 Dave Stammerjohan likes this CO2 original



No. 12 An original Wakefield design from Australia by B. Felstead

Meet The Slide Rule



By William Vassalo

THE dexterous hands of the aeronautical engineer made some swift movements on his slide rule, jotted down figures on the drawings he was working on, and he sat back with a satisfied look on his face. This purely imaginative engineer, which incidentally could well be authentic and generally is, is a good example of the slide rule in action in the many aviation companies throughout the country today. Although his expression of satisfaction might also be changed into one of disappointment, the results obtained with this instrument are always rapid.

This might well be the model builder, who also spends a great deal of his time draped over the drawing board. While the average builder is inclined to shy away from technical formulas, higher mathematics, and the use of the slide rule in his quest for better performing models, a simplified knowledge of these factors will greatly facilitate his ability as a modeler.

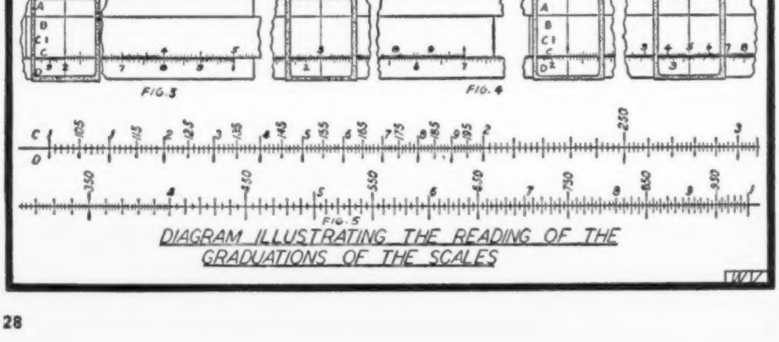
By making certain manipulations on the slide rule, all problems involving division and multiplication melt away right before your eyes, without mental strain, or the necessity of having large sheets of paper in front of you. Time is of paramount importance in the life of a modeler, and calculations done on the slide rule take only a small fraction of the time required if one was to work them out in the usual manner. Learning how to use the slide rule properly will benefit the modeler not only in being an indispensable aid in time spent designing models, but in the practical everyday problems which always seem to have a knack of cropping up during the course of a day in school, at home, or at your place of business.

The photo herewith shows three slide rules of various makes, sizes, and prices. The one at the top was made in Germany and is the most expensive, being heavy and well made. With this type highly accurate readings may be taken; it gives results correct to within 1/10th of one per cent. The two bottom ones are of a cheaper make, and can be bought at any store selling drafting instruments and supplies. They sell at various prices ranging from $1.50 up. However, due to that ever-present cost of living nowadays, I would advise purchasing a cheap one, inasmuch as the resultant data will be accurate enough for our purposes.

Before we go further into this, keep in mind that accuracy and speed can only be acquired by constant practice. In a short time you will be an expert in the ways and means of this useful instrument.

If you take a close look at the illustration, you'll find that the rule consists of three parts, the body, the slide which moves in the groove, and the runner. The runner is made of either glass or heavy celluloid marked with a vertical hairline to allow accurate readings. There are many variations of the slide rule, but the ones shown are the most common and easily understood. The body of the rule has three scales A, D, and K, with three corresponding scales on the slide, namely B, C and C1. Supposing you wanted to multiply 3 x 2 (See Fig. 1). Move the slide until you have 1 on scale C opposite 3 on scale D. Now position the runner so that the hairline coincides with 2 on scale C. Look down and the answer 6 will stare you in the face. Let's work one more, something a bit more difficult, and shown in Fig. 2. Multiply 3 x 3 by setting the left hand 1 of C over 3 on D. Move the indicator over the 3 on C and pick up your reading of 9 directly below. Simple isn't it?

On many occasions, while working out various problems, the answer will be found to lie beyond the right hand end of the rule. For example, if we were multiplying 5 x 5 using the method outlined in the preceding paragraphs, the place for reading the answer would fall outside the end of the rule. In such cases use the right hand 1 of C to obtain your answer. To clarify this further, multiply 5 x 5 by moving the right hand 1 of C over 5 on D. Then move the runner to the left until the hairline is directly in line with 5 on C and find your answer of 25 below.

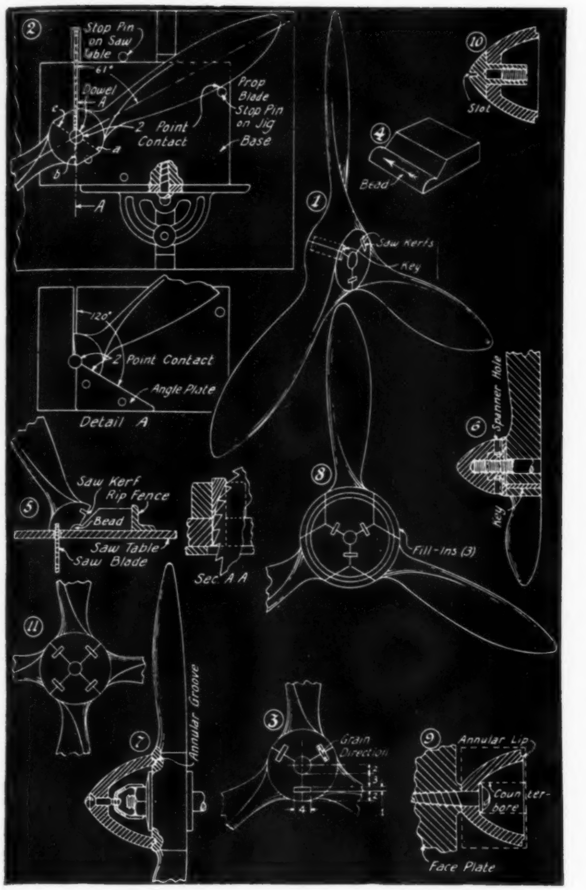


By looking closely at the rule you will find that there are intermediate markings between the large numbers. You have, more than likely, wondered at this. Consulting Fig. 5, let's say the 1 on the left side of the rule represents 100 and the right hand one, 1000. Then the small numbers between the left hand 1, and the large 2 about a third along the scale, will be 110, 120, and so on. Between the 100 (or 1 mark at the left scale end) and the 110 mark, small unmarked divisions represent 101, 102 . . . etc.

The large 2 represents 200, and the smallest divisions here are read by 2s; that is, 202, 204, etc. Between the large 4 (or 400) and the end of the rule, readings by 5's are indicated. You will notice that the markings grow gradually smaller as you reach the end or right hand side of the rule. Because the function of the rule was built upon the application of logarithmic principles, this was, of course, a necessity.

Decimal points are not taken into consideration when using the slide rule and must be pointed off as required by each individual problem, after it is worked. The rule finds the whole number only and the pointing off you do yourself.

(*Turn to page* 53)



MULTIBLADE PROPS AND SPINNERS

by Ray Rusher

WHILE they are impractical to carve from one piece of wood, 3-blade props may easily be made from 2-blade props with the blades cut apart and joined by keys as described below. A tensile test of this type of joint showed that it would withstand over a 200-lb. pull. The pull on each blade of a 12" diameter prop, due to centrifugal force, is about 96 lbs., providing the prop weighs 8/10 oz. and rotates at 8000 rpm. This type of joint can therefore be used with a safety factor of two-to-one, not taking into consideration that additional anchorage for the roots of the blades is had by friction of the prop shaft washers against the prop when the nut is tightened. If you have three 2-blade props, each one with a blade broken, the good blades can be made into a 3-blader, as long as the blades are of the same diameter, pitch and shape. The finished 3-blade prop is shown in drawing 1.

If you don't have any broken props, three 2-blade props can be carved and will provide the necessary blades for two 3-blade props. An easy carving method which provides blades that are similar throughout is described in our July, 1943, issue, page 35. Be sure to select three prop blanks that are the same weight, to minimize the possibility of unbalance after the multi-blade props are completed.

After the 2-blade props are carved, make a jig as in drawing 2, to cut the roots of the blades with two faces at an angle of 122° to each other. A board is attached to the crosscut fence of a circular saw to serve as a base for the jig. A dowel is glued in a hole of the base to locate the crankshaft hole of the prop in relation to the blade of the saw which is used to cut the hub faces. Note: the center of the dowel is slightly to the left of the right face of the saw which results in slightly less than a half circle for the crankshaft hole sector of the right hand prop blade so that after the three blades are assembled the hole can be drilled out to the proper size and true circle shape. Always be sure to make the first cut with the front of the prop up.

The jig and the crosscut fence are advanced to a point where the saw cuts through only one side of the prop hub and into the dowel as in section A-A. The prop is then turned over with the back up and the other side of the hub cut as indicated at *a*. The other blade is next cut at *b* and *c* in a similar manner. After the second and third 2-blade props are cut the same way, the removable angle plate of detail A is mounted on the base plate of the jig and one side of the hub recut to secure an accurate 120 deg. angle. In making this cut, be sure the front face of each blade is up, or the wrong side of the hub may be recut on one of the blades and you will end up with 122° for one blade and 118° for the other.

The saw slots, or kerfs, for the keys are sawed next. Suggested proportions are shown in drawing 3. The guide block of drawing 4 is used as in drawing 5 by clamping it to the saw table, or by moving it with the prop blade along the rip fence. With the saw set for the proper depth of cut, slide the prop blade along the bead of the guide block as indicated by the arrow in drawing 5 if the block is clamped to the saw table. All the saw kerfs can thus be cut exactly alike.

The keys are made preferably of maple ripped to the width of the saw kerfs and twice as wide as the depth of the kerfs. Make them fit snugly without sloppiness to secure well glued joints that will withstand the pull generated by centrifugal force when the assembled prop is put into operation. Before gluing, select three blades for each prop which most nearly match each other in weight—this will help minimize unbalance of the finished prop. A good grade of glue is recommended for maximum strength. *Casco*, model airplane cement and *Cascamite* are suitable. The first two are more flexible than *Cascamite* and therefore a better fit of the parts of the joint is required for the latter. Provide some type of clamp or wrap the hub tightly with stout cord for holding the blade hub faces in contact under pressure while the glue sets.

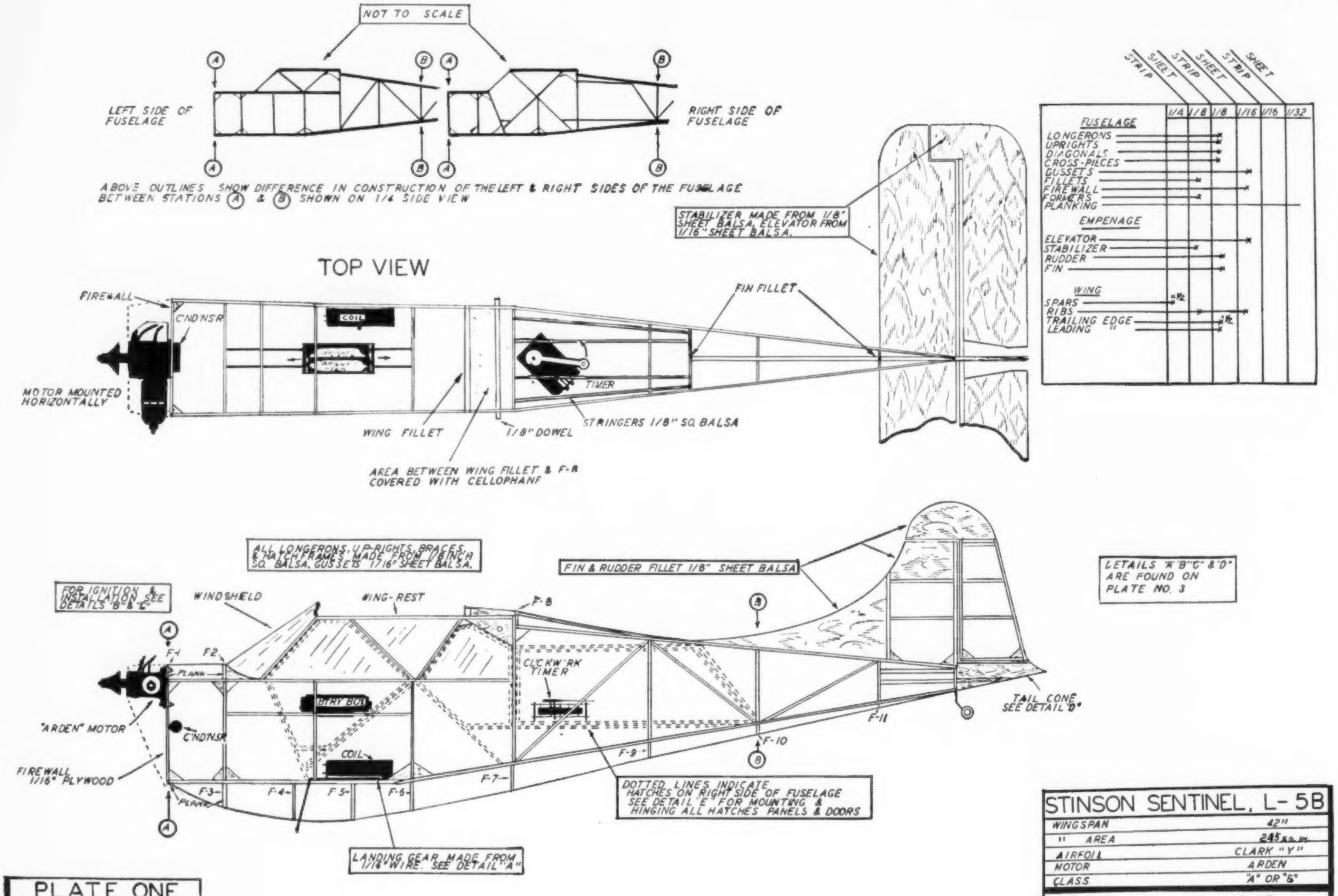
After the glue sets, carve away any unevenness of the hub periphery where the faces of adjacent blades meet, trim off any projecting portions of the keys and sand the hub faces smooth. Then drill the crankshaft hole out to the proper size. The prop is now ready for balancing, sanding and finishing with varnish as described in the June, 1946, issue of MODEL AIRPLANE NEWS, page 68. The prop can be mounted on the crankshaft by means of either a spinner nut as in drawing 6 or with the usual washer and hex nut as indicated by dotted lines.

If you prefer a large spinner of the kind shown in drawing 7 to serve as a nose piece for your fuselage, don't carve the prop blades as far toward the center; also, glue three sector shaped fill-in pieces between the blades as shown in drawing 8. Before balancing the prop, turn an annular groove in it to receive the rear edge of the spinner.

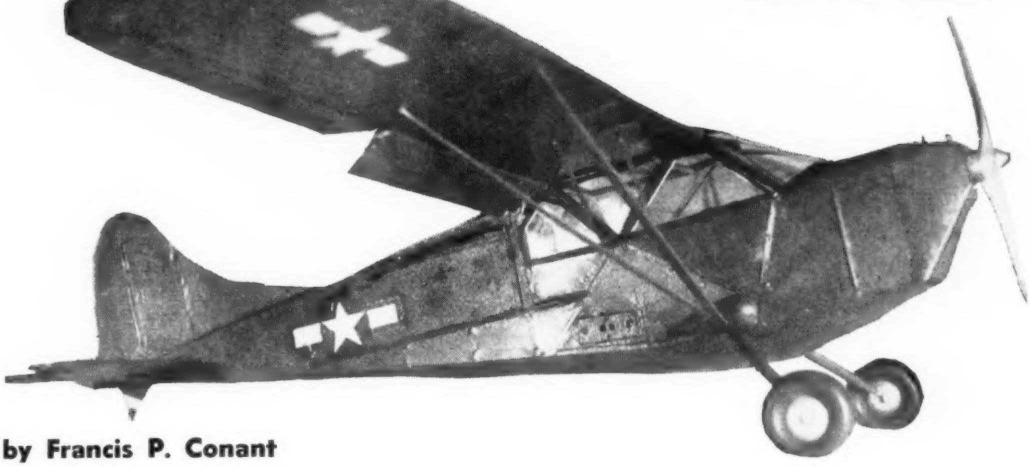
The spinner is turned from a block of wood as described in the January, 1947, issue, page 37. That article also lists the relative diameters of 2- to 6-blade props to secure comparable results. The block is shown in its original shape by dotted lines and is secured to a lathe face plate as in drawing 9. After the block is mounted, turn both the inside and the outside to the shape shown and turn an annular lip on the rear edge of the spinner to enter the annular groove of the prop.

The spinner may be mounted on the prop by means of a countersunk machine screw and a U-shaped clip threaded to receive it as in drawing 7, or a special tubular crankshaft nut of the kind shown in drawing 10 can be made. This has a head that finishes out the nose of the spinner and holds both it and the prop against the prop drive washer.

The prop making method described is also adapted for 4- and 5-blade props. Drawing 11 shows a 4-blader. It might even be designed as a 6- of 7-blader but there is a limit to the number of blades due to lack of hub material in which to mount the keys and yet have the necessary strength to prevent throwing the blades because of centrifugal force.


NOT TO SCALE
LEFT SIDE OF FUSELAGE
RIGHT SIDE OF FUSELAGE
ABOVE OUTLINES SHOW DIFFERENCE IN CONSTRUCTION OF THE LEFT & RIGHT SIDES OF THE FUSELAGE BETWEEN STATIONS A & B SHOWN ON 1/4 SIDE VIEW
STRIP SHEET STRIP SHEET STRIP SHEET
1/4 1/8 1/8 1/16 1/16 1/32
FUSELAGE
LONGERONS
UPRIGHTS
DIAGONALS
CROSS-PIECES
GUSSETS
FILLETS
FIREWALL
FORMERS
PLANKING
EMPENAGE
ELEVATOR
STABILIZER
RUDDER
FIN
WING
SPARS
RIBS
TRAILING EDGE
LEADING "
STABILIZER MADE FROM 1/8" SHEET BALSA, ELEVATOR FROM 1/16" SHEET BALSA.
TOP VIEW
FIREWALL
CNDNSR
COIL
TIMER
FIN FILLET
MOTOR MOUNTED HORIZONTALLY
WING FILLET
1/8" DOWEL
STRINGERS 1/8" SQ. BALSA
AREA BETWEEN WING FILLET & F-8 COVERED WITH CELLOPHANE
ALL LONGERONS, UP-RIGHTS, BRACES, & HATCH FRAMES MADE FROM 1/8 INCH SQ. BALSA. GUSSETS 1/16" SHEET BALSA.
FIN & RUDDER FILLET 1/8" SHEET BALSA
LETAILS "A" "B" "C" & "D" ARE FOUND ON PLATE NO. 3
FOR IGNITION & INSTALLATION SEE DETAILS "B" & "C"
WINDSHIELD
WING-REST
F-8
F-1
F2
PLANK
CLCKW'RK TIMER
BTRY BOX
"ARDEN" MOTOR
CNDNSR
COIL
TAIL CONE SEE DETAIL "D"
F-11
F-10
F-9
F-7
F-3
F-4
F-5
F-6
PLANK
FIREWALL 1/16" PLYWOOD
DOTTED LINES INDICATE HATCHES ON RIGHT SIDE OF FUSELAGE SEE DETAIL "E" FOR MOUNTING & HINGING ALL HATCHES PANELS & DOORS
LANDING GEAR MADE FROM 1/16" WIRE. SEE DETAIL "A"
STINSON SENTINEL, L-5B
WINGSPAN 42"
" AREA 245 SQ. IN.
AIRFOIL CLARK "Y"
MOTOR ARDEN
CLASS "A" OR "B"
DRAWN BY F. P. CONANT
PLATE ONE
1/4. SCALE

STINSON L5B



by Francis P. Conant

EARLY in World War II the Army Ground Forces recognized the need for a light airplane embodying great utility, to be used to supplement the direction of Field Artillery fire, for ground survey, and for closer cooperation between armored and infantry forces. These needs were met by the famous L-4, or *Grasshopper*, the military version of the J-3 Piper *Cub*.

As the war progressed, it became apparent that in addition to the services performed by the L-4, there were several more urgently needed. To encompass all the old duties of the *Grasshopper*, and the new ones, a different airplane would have to be developed with greater horsepower, longer range, and still retain the ability to land in small fields. The L-5, designed by the Stinson division of Consolidated Vultee, was the answer to the demands of military necessity. The L-5 series are powered by a 190 hp, horizontally opposed engine, and cruise at approximately 120 mph. Flaps permit a slow speed comparable to that of an L-4 airplane. The L-5's are convertible into ambulance airplanes—one of the new duties for which the L-5's were designed.

The model of the L-5 that we show here is a reasonably faithful replica of the real airplane. Some concessions had to be made, however, to insure a stable model that would give many successful flights and hours of enjoyment to the builder.

The plans for the fuselage and empenage are drawn quarter size, while the plans for the wing and body formers are drawn half size. Bring these plans up to the proper scale before starting construction of the model. The easiest way to do this is to use a pair of proportional dividers, or plain dividers.

FUSELAGE. The fuselage is constructed of 1/8" sq. balsa. Note on the plans it is indicated that while the outlines of the left and right sides of the fuselage are the same, the interior construction is quite different between stations "A" and "B". The exact differences are shown on the side view by the dotted lines and by the silhouettes of the two fuselage sides at the top of Plate One.

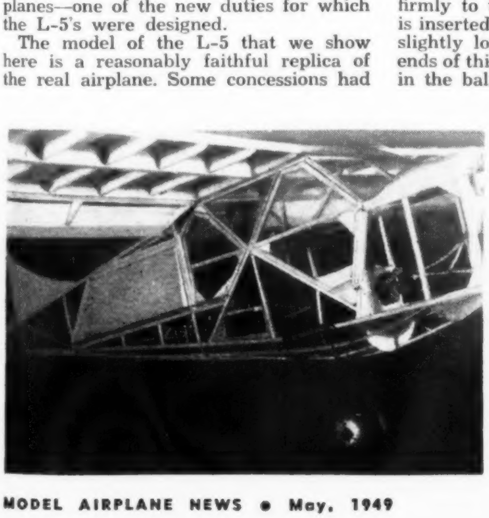
The doors and hatches are hinged in exactly the same manner as the control surfaces. 1/32" aluminum tubing is cut to a length slightly smaller than the side of the panel to be hinged and is glued firmly to this side. A springy steel wire is inserted through this tubing and is left slightly longer than the hinge line. The ends of this wire are bent 90°, and inserted in the balsa framework surrounding the door, hatch or panel. Motor inspection panels are inserted and hinged, as outlined above, between the first and second uprights on each side of the fuselage.

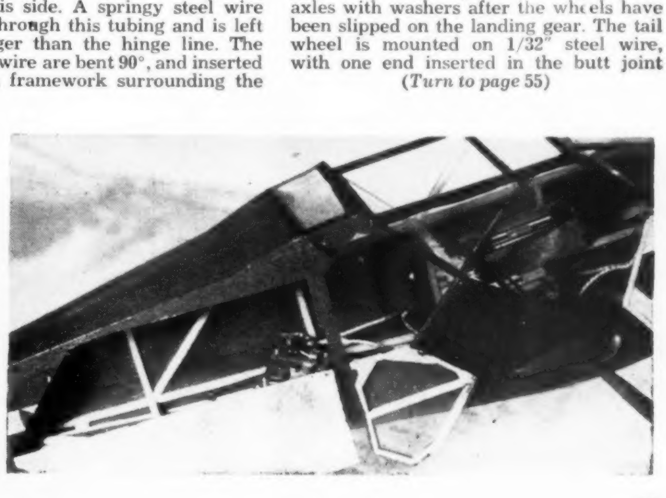
The fin is an integral part of the fuselage, and care should be exercised to insure that it is perpendicular to the fuselage frame.

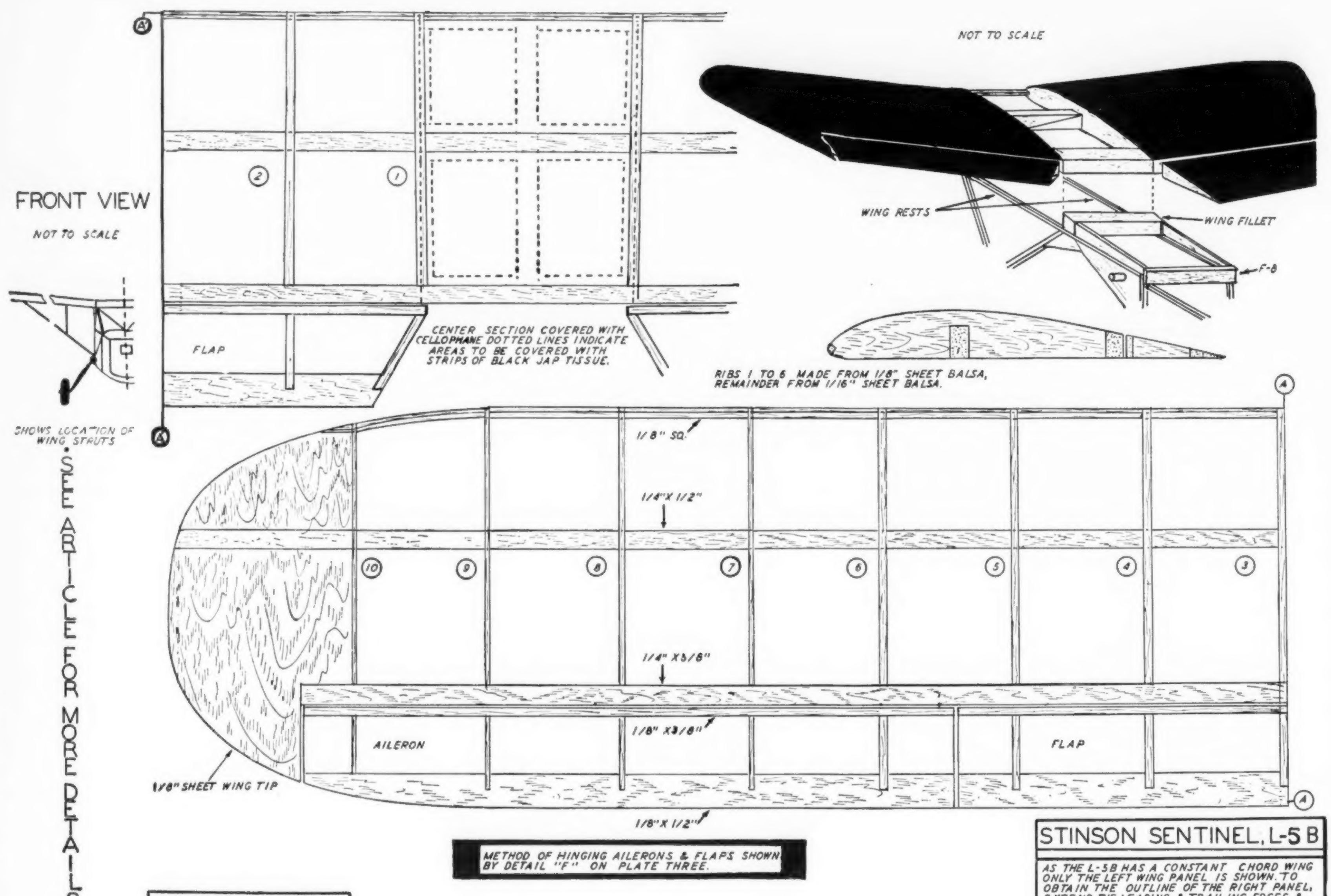
LANDING GEAR. The landing gear is bent from 1/16" steel wire to the form indicated in Detail "A", on Plate 3. To secure the landing gear to the bottom fuselage longerons, bind the gear to these members with strong thread and then glue liberally. The landing gear fillets are made from soft, scrap balsa. The streamline fillet is notched to allow for the spreading of the landing gear when the model lands. The landing gear strut fillet is made from a piece of 1/4" sq. balsa, tapered and notched (or grooved) along its entire length. Bind this fillet to the leg of the landing gear, at each end, with strong thread. Fill in the groove with cement.

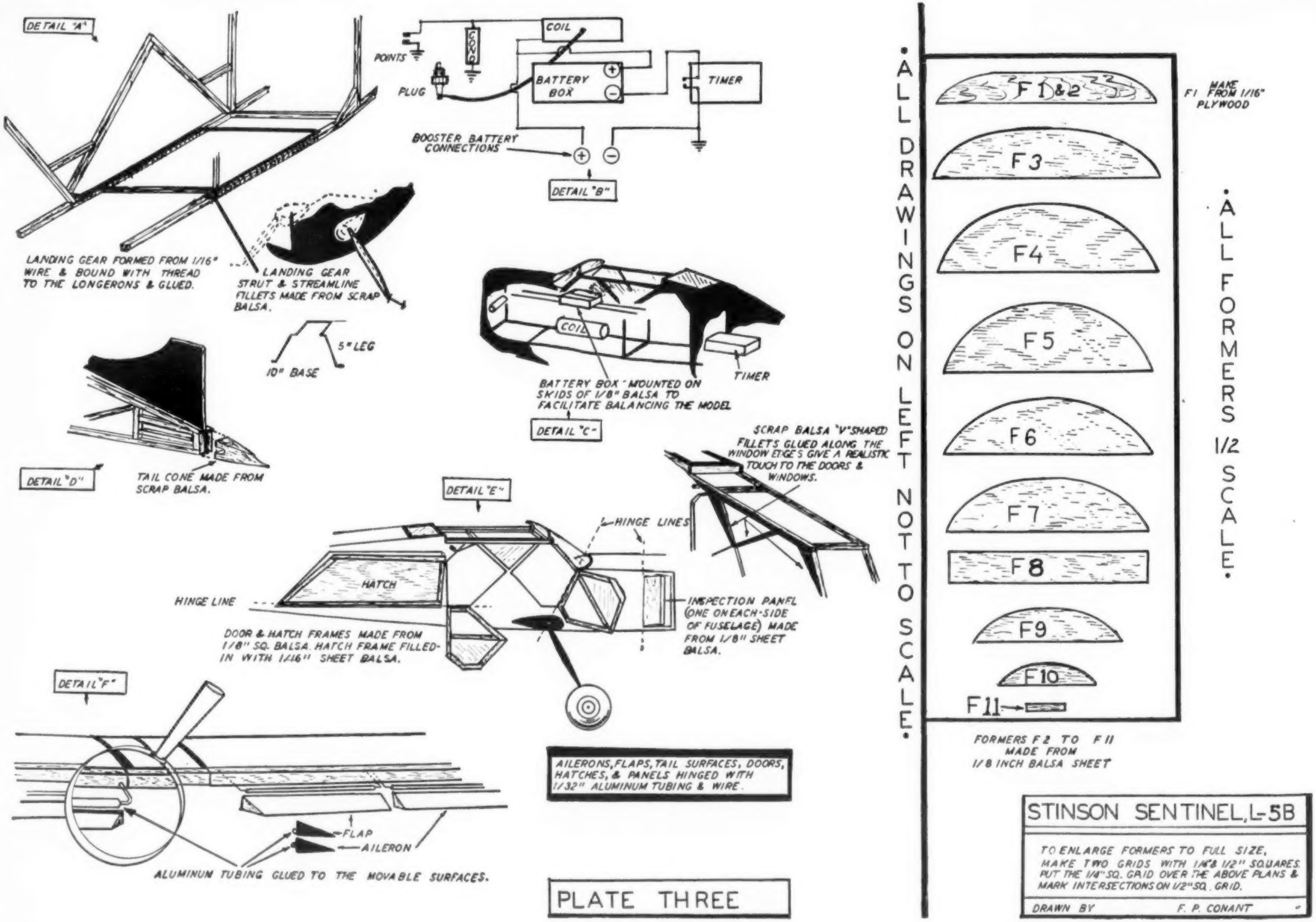
Secure the wheels, which may be of either the balsa or pneumatic type, to the axles with washers after the wheels have been slipped on the landing gear. The tail wheel is mounted on 1/32" steel wire, with one end inserted in the butt joint

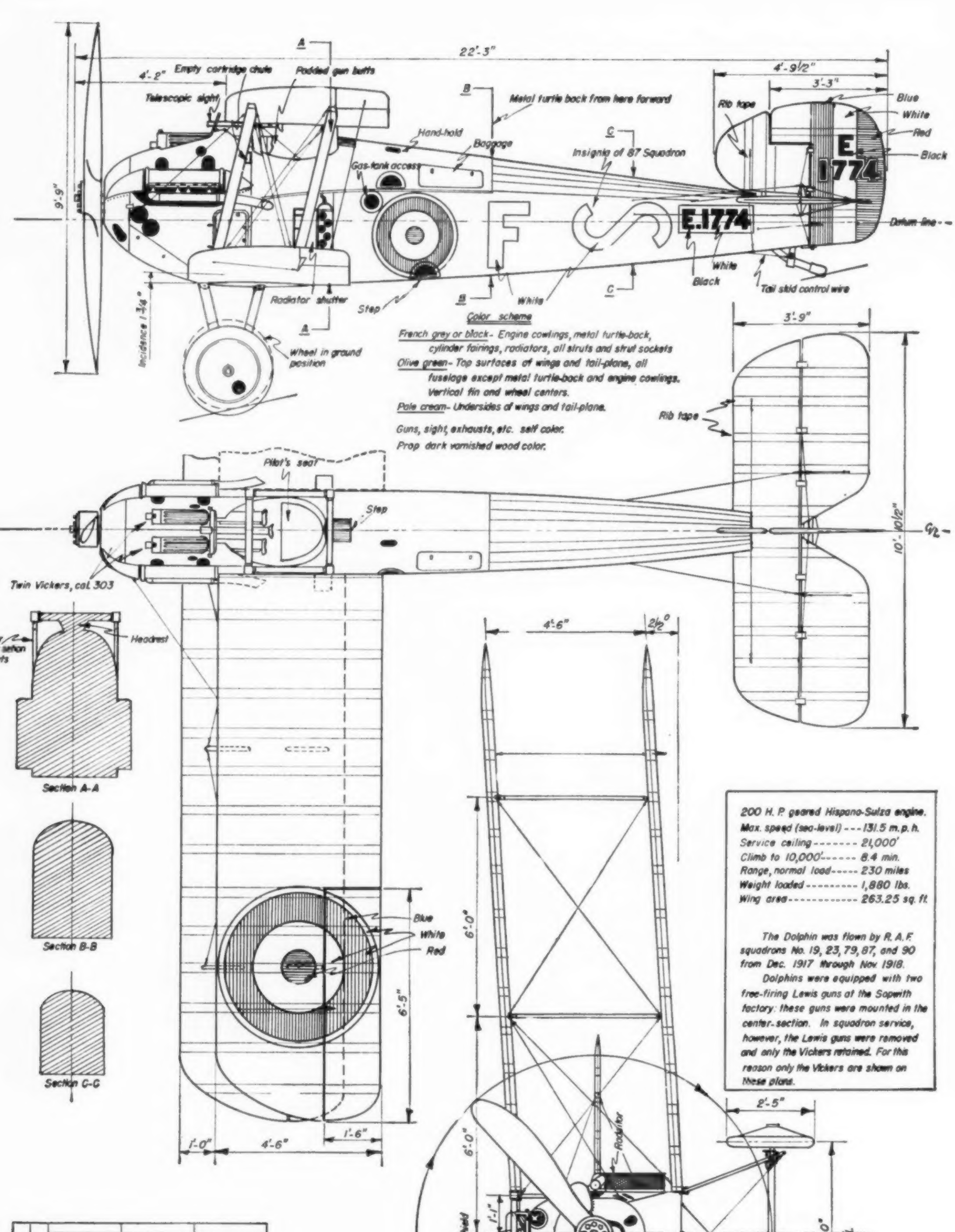
(*Turn to page* 55)






STINSON SENTINEL, L-5 B
AS THE L-5B HAS A CONSTANT CHORD WING ONLY THE LEFT WING PANEL IS SHOWN. TO OBTAIN THE OUTLINE OF THE RIGHT PANEL, EXTEND THE LEADING & TRAILING EDGES & SPARS OF THE LEFT PANEL (AFTER IT HAS BEEN ENLARGED) TO THE PROPER LENGTH. USE THE LEFT WING TIP AS A GUIDE FOR THE RIGHT TIP.
PLATE TWO
1/2 SCALE
FRC
FRONT VIEW
NOT TO SCALE
SHOWS LOCATION OF WING STRUTS
SEE ARTICLE FOR MORE DETAILS
NOT TO SCALE
WING RESTS
WING FILLET
F-8
CENTER SECTION COVERED WITH CELLOPHANE DOTTED LINES INDICATE AREAS TO BE COVERED WITH STRIPS OF BLACK JAP TISSUE.
FLAP
RIBS 1 TO 6 MADE FROM 1/8" SHEET BALSA, REMAINDER FROM 1/16" SHEET BALSA.
1/8" SQ.
1/4" X 1/2"
1/4" X 3/8"
1/8" X 3/8"
1/8" X 1/2"
AILERON
FLAP
1/8" SHEET WING TIP
METHOD OF HINGING AILERONS & FLAPS SHOWN BY DETAIL "F" ON PLATE THREE.


DETAIL "A"
LANDING GEAR FORMED FROM 1/16" WIRE & BOUND WITH THREAD TO THE LONGERONS & GLUED.
LANDING GEAR STRUT & STREAMLINE FILLETS MADE FROM SCRAP BALSA.
5" LEG
10" BASE
DETAIL "D"
TAIL CONE MADE FROM SCRAP BALSA.
COIL
POINTS
PLUG
BATTERY BOX
TIMER
BOOSTER BATTERY CONNECTIONS
DETAIL "B"
COIL
TIMER
BATTERY BOX MOUNTED ON SKIDS OF 1/8" BALSA TO FACILITATE BALANCING THE MODEL
DETAIL "C"
SCRAP BALSA "V" SHAPED FILLETS GLUED ALONG THE WINDOW EDGES GIVE A REALISTIC TOUCH TO THE DOORS & WINDOWS.
DETAIL "E"
HINGE LINES
HATCH
HINGE LINE
INSPECTION PANEL (ONE ON EACH SIDE OF FUSELAGE) MADE FROM 1/8" SHEET BALSA.
DOOR & HATCH FRAMES MADE FROM 1/8" SQ. BALSA. HATCH FRAME FILLED-IN WITH 1/16" SHEET BALSA.
DETAIL "F"
FLAP
AILERON
ALUMINUM TUBING GLUED TO THE MOVABLE SURFACES.
AILERONS, FLAPS, TAIL SURFACES, DOORS, HATCHES, & PANELS HINGED WITH 1/32" ALUMINUM TUBING & WIRE.
PLATE THREE
• ALL DRAWINGS ON LEFT NOT TO SCALE •
F1 & 2
F1 MAKE FROM 1/16" PLYWOOD
F3
F4
F5
F6
F7
F8
F9
F10
F11
• ALL FORMERS 1/2 SCALE •
FORMERS F2 TO F11 MADE FROM 1/8 INCH BALSA SHEET
STINSON SENTINEL, L-5B
TO ENLARGE FORMERS TO FULL SIZE, MAKE TWO GRIDS WITH 1/4" & 1/2" SQUARES. PUT THE 1/4" SQ. GRID OVER THE ABOVE PLANS & MARK INTERSECTIONS ON 1/2" SQ. GRID.
DRAWN BY F. P. CONANT



200 H. P. geared Hispano-Suiza engine.
Max. speed (sea-level) - - - 131.5 m. p. h.
Service ceiling - - - - - - - - 21,000'
Climb to 10,000' - - - - - - 8.4 min.
Range, normal load - - - - - 230 miles
Weight loaded - - - - - - - - - 1,880 lbs.
Wing area - - - - - - - - - - - - 263.25 sq. ft.

The Dolphin was flown by R. A. F. squadrons No. 19, 23, 79, 87, and 90 from Dec. 1917 through Nov. 1918.

Dolphins were equipped with two free-firing Lewis guns at the Sopwith factory: these guns were mounted in the center-section. In squadron service, however, the Lewis guns were removed and only the Vickers retained. For this reason only the Vickers are shown on these plans.

GENERAL ARRANGEMENT - EXTERIOR
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S. F. 1. "DOLPHIN"
BUILT BY THE
SOPWITH AVIATION CO., LTD.
Kingston-on-Thames

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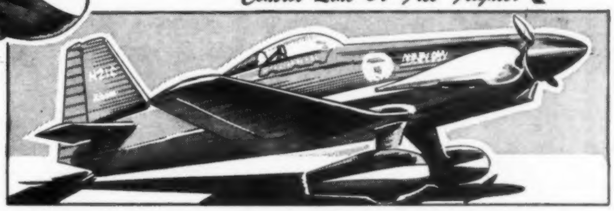
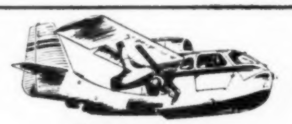


AN AUTHENTIC SCALE KIT OF A REAL PLANE

From Cleveland, City of Champions, comes Cleveland Model's easy on the pocketbook one-dollar kit of this super-sleek, winning racer. Truly one of the fastest looking planes ever designed. It's a 24" span built-up "IT" kit, and while it is primarily designed as a rubber powered flying model which anyone can very easily build, it is accurate and authentic, and it will make the finest "proto" racer you ever saw. Instructions for building it for proto racing are included. The kit is complete except for power unit and liquids. The original "Minnow" is one of three "Cosmic Wind" type designs built specially for the Goodyear races by Tony LeVier and Associates, a California group. With an 85 h. p. motor, it hit 169.6 m.p.h.

FOKKER D-7 Span 21¼" $1.75



REPUBLIC SEABEE Span 28" . . . $2.25

BAYLES' GEE-BEE Span 17¾" $1.75

LOCKHEED F-80 29¼" SHOOTING STAR $2.75

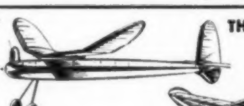
BEECH. BONANZA Span 25¼" . . $1.50

RYAN NAVION Span 25¼" $1.75

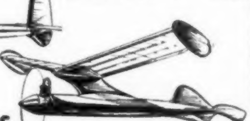
AUTHENTIC ¾" SCALE "M" (Master) MODELS — THE WORLD'S FINEST KITS

It is difficult to tell a C-O-2 powered "M" model from a real plane in flight. These outstanding Cleveland-Designed ¾" scale flying models are the successors to the world-famous "SF" kits. There is really no difference between them except that they no longer contain liquids, and therefore sell at a lower price. These kits are the finest that money can buy, and are accurate, authentic miniatures of the real thing. They are of light, "built-up" construction, and may be flown with rubber or C-O-2 motors. (No motive power or flying propellers supplied.) They

FLEETSTER 32" $1.25



THERMALIER 35" $1.00



LANCER 32" $1.00

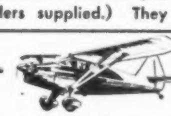
CONTEST AND SPORT ENDURANCE JOBS

These three endurance models are specifically designed for the tiny, powerful C-O-2 motor, but may be flown with rubber power. They all have great natural endurance. Our test models have flown out of sight repeatedly. The "Thermalier" is an improved version of a great pre-war favorite. The "Lancer" is a super-efficient, years-ahead design that builds fast and easy. The "Baby Fleetster" is a realistic type cabin model which has outstandingly good looks and snappy performance. There is a world of carefree flying fun in these splendid designs.

POPULAR 30" SPAN, ONE DOLLAR SCALE FLYERS

These conveniently sized, popularly priced scale models are flight-engineered, and have won immense popularity wherever realism, flying ability, and low prices are sought. Their full sized plans are complete, easy to follow, and accurate. 30" span is ideal for rubber or C-O-2 motors, and for the ease with which they are built and flown.

FOKKER D-8



STINSON VOYAGER

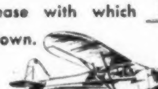
LUSCOMBE SEDAN

RYAN NAVION

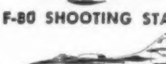
F-80 SHOOTING STAR

GLOBE SWIFT

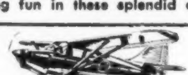
ERCO ERCOUPE



PIPER CUB



GRUMMAN PANTHER



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Report From the West

(Continued from page 6)

flight total of 15:09.6. He was flying a beautiful original design. We talked to Ray later the same day and he informed us of a keen plan that the *Flight Masters* are using. In order to raise money to help finance eligible members to the 1949 Nationals, the club is sponsoring a series of meets. The entire proceeds go into a fund which will be used this year for expenses. The first meet since the starting of this fund was a Pee Wee *(Thimble Drome)* car contest held on Western and Rosecran's Thimble Drome Track. Some fifty cars were entered, so this should give their fund a pretty fair start.

We took in the Northrop U-Control Meet February 20 open to Northrop boys only. There is really a swell gang over there with a lot of planes. With approximately 60 entries, most of them in scale, the meet was run off very smoothly under the direction of Mr. Holt, a Northrop Instructor.

Russ Snyder, formerly of Dallas, Texas, is now attending Northrop Institute. Russ won stunt by a large margin of points and he's pretty sharp on the controls. We are expecting Russ to give the local boys some hot competition in the coming U-control precision meets.

We don't want to forget to mention the *Thermal Thumbers* Wakefield Contest May 22nd. The entries will be teams of five men each. Strict Wakefield rules will be followed, so get together five boys from your club and come out and really show 'em. For further information write to: Loran Salisbury, 2507 California St., Huntington Park, California.

A.M.A. Record Trials at Long Beach, California proved successful February 27, 1949. We saw a few of the boys make some mighty swift flights in U-Control speed, three of them breaking A.M.A. records.

The familiar West Coast type of construction with metal wings and wooden fuselage, was used by those who set records. Richard Rigney, the originator of this type construction, really showed the boys how it works. Making only one run in Class D speed, he set a Senior mark that will be hard to beat—the time was 152.48 mph. Dick also flew his Class C job to a new record of 130.09 mph. He was using McCoy engines in both airplanes.

Don Newberger came through to claim the Class B record with a speed of 121.49 mph. Don's design, the *Whirlaway*, will soon appear in kit form.

June Dyer (standing at rear) Contest Manager for S.F.M.A.C. meet Jan. 16, with Clare Bussard, Sec. of *AMANC*, Bob Palmer and his *Go Devil Sr.*, and Ray Mayes, Pres of *AMANC*

The team of Wayne Leasure and Mel Weaver had a very successful run in Class D Open with a speed of 144.87 mph.

There is an all free flight meet scheduled for May 7 & 8, 1949 that we are sure no West Coast flyer will want to miss. The meet will be held at Cranford Airport—Artesia, California. Events will include free flight gas A B C & D, towline glider, hand launch glider, rubber cabin, rubber stick, and Wakefield with loads of great awards. The individual directors for each event, Bob Holland, Ray Acord, Bill Atwood, Don Newberger, Frank Cummings, and Lew Mahieu assure you this meet will be one of the finest, if not the finest of 1949, Ray Acord, 741 N. Prairie Ave., Hawthorne, can give you full details.

Next month watch this column for news on that well known engine designer and manufacturer, Mel Anderson.

Rudder Bug

(*Continued from page* 11)

longitudinal recovery. This has been verified in the air. The high lift NACA 6412 wing section is set with its bottom at 0° incidence. The C.G. is at 37% of the wing chord, and the stab is set at −2.5°. During tests, the C.G. was varied from 25% to 40% accompanied by the corresponding stab setting, with the above figure giving the best recovery.

The good spiral stability of the model is attributed primarily to the proper relationship between dihedral and fin area, plus the "washed-out" wing tips, which reduce wing tip drag. The wing has 9° in each panel, or a total of 18° dihedral. The fin area is 5%. The wing tips have a built-in negative twist of about 2.5° which also helps prevent tip stall and promotes clean recovery.

How many controls should a radio control model have? The author believes that if you want to spend lots of time in the air and very little on the ground, then you should choose the most effective control combined with the greatest simplicity and reliability. Currently, the author prefers rudder control. It must be pointed out that the infancy of the radio control game has not allowed real standardization of "the" final system. Many other systems suggest themselves. Rudder with coupled elevator to give tight nose-high turns looks good. Maybe ailerons alone would do? A butterfly tail with its combined rudder and elevator could be worked out. The *Rudevator* of Owbridge and Schumacher has been perfected and gives coupled turns plus up-and-down. These are but a few of the possibilities. Many flight tests of these and other ideas will be required before standardization occurs.

The fantasy that radio control ships need large engines was finally dispelled at the 1948 Nationals, where several ships appeared with Class B engines! The *Rudder Bag* mounts a *DeLong B* which does very nicely; in fact, on some flights it would have been desirable to throttle it back after reaching maneuvering altitude. The important point is to use a steady, reliable engine—not a host of power. After all this is not a screaming contest ship!

The accessibility is measured by the ease with which you can get at the receiver, the batteries, the escapement, and the wiring. Two large doors, one on each side of the cabin, give entrance to the receiver and battery compartment. Converted free flight designs usually cannot afford such large access openings because their structures would be too greatly

weakened. The doors, which hinge along the bottom edges, allow quick checks of battery condition and adjustment of the receiver. The escapement and its linkage are mounted within the fuselage just below the fin and are reached through the bottom of the fuselage when the stab is removed. The escapement rubber band threads forward in the body and is wound through the cabin door. Winding once a week is recommended! Removal of wing and stab does not interfere with any of the radio installation, thus you need only the fuselage for radio testing, a handy consideration in a small workshop. Because the cabin roof is covered, there are no dust catching holes when the model is stored. This also protects the sensitive relay contacts from excessive contamination.

It is desirable that neutral rudder result in straight flight with engine power both on and off. Similarly, fixed left and right rudder deflections must produce equal sized circles. Can you adjust your contest gassie to do this?

Of course, if the normal torque effects could be eliminated, the problem would be solved. A method is used here which does not eliminate the torque effects, but greatly reduces them. This type of model would normally be expected to turn left under power. A large portion of the "left turning" torque is due to the spiralling prop wash acting heavily on the left side of the fin because the fin is usually well above the thrust line. In this model the fin has been lowered drastically such that the thrust line is directed through, or slightly above, the center of the fin area. As a result, this model flies straight with no motor off-set! An earlier model which had the whole fin completely below the thrust line turned violently to the right "against the torque" with all adjustments neutral. So don't ignore the spiralling slip-stream. Gene Foxworthy has another solution by removing the fin from the slip-stream and using double fins on the tips of the stab.

Proneness of the two-wheel gear on the old *Guff* to cause ground loops led us to try something different. Jim Walker's demonstration of his tricycle gear provided the answer. While all three of the wheels are fixed it still is possible to "steer" the model with the rudder during the take-off phase. Long, lazily realistic take-offs are made comparatively easy. Landings, too, benefit from the fact that very little bounce results, even on a hard runway. "Flat" landings have been made which exhibited no perceptable bounce followed by a terrific roll she really needs brakes! Remember the wheels absorb most of the landing shock, so choose good rubber ones, especially for that poor nose wheel.

Real ruggedness is required to withstand violent maneuvers and an occasional rough landing. Experience has shown that the radio equipment is far more shock resistant than the model. So if you have to retire from the field early, it's more likely to be due to an unrugged model. Also, there is a payload aboard which stresses the model structure too. Plywood firewall and plywood landing gear platform aid the strength. The nylon covering has held up well even through two bad landings; one in a tree, the other downwind into a fence. In fact, total damage was a broken prop and a few dents. The nylon is strongly recommended.

Since most of you are familiar with standard building methods, only general

construction notes will be given. The materials should be carefully selected. All pieces may be cut from standard sizes except the two crutch longerons, which require splicing. Due to the crutch type construction, most of the body can be built before removing from the board. The 1/8" diameter steel landing gear wire is fastened in position with "J" bolts. The motor cavity is suitable for a variety of engine sizes. Note: motor beans are replaceable. The slab-sided nose is not as pretty as a cowl, but is certainly easier to make and is a practical expedient.

Attention is called to the 1/8" floor in the forward section of the body. Batteries are mounted along this floor. Wing and tail fasten to the body by conventional rubber band methods. Use plenty of glue on all joints; two or three coats will repay the effort in greatly added strength.

The wing spars were first carefully joined at the correct dihedral angle and then the ribs and other parts were assembled. The trailing edge of 1/8" was copied from Effinger's *Buccaneer*. To produce the built-in negative twist in the tips, build the entire wing flat with "square" tips. Then slice off the angled trailing edge and shape the bottom of the ribs to fair smoothly into the trailing edge. The tip rib should have a perfectly flat bottom. The nylon covering worked best for the author by covering "wet" the same as silkspan. This way no stretching is required although repeated wetting may be needed because nylon dries quickly. The model was doped with three coats of clear and two of color which naturally was a deep orange.

The fin is symmetrical and is cemented to the body after covering. The movable rudder is made from very light 3/16", which is intentionally left thick to operate effectively. Make sure that the rudder moves easily without stickiness. A 7° angle or about 1/8" deflection of this rudder gives a very tight turn so start your test flights by pinning it in a neutral position.

The stab has a symmetrical section and a full depth spar. Keep it light to prevent tail heaviness.

A breakdown of weights is listed on the drawings to be used as a guide.

The original model was test flown with no radio gear aboard. The purpose was to obtain approximate trim adjustments, become familiar with the model's characteristics and provide a "shakedown" test. With no payload the wing loading is about 10 oz. per square foot, which makes testing easy. Balance the model at 37% (4-1/2" behind leading edge) by adding weight at the nose or tail. Check the motor for no off-set. It is assumed all warps have been removed. Glide test for a clean fast glide with no sign of a turn. Alter stab and rudder settings to accomplish this. When satisfied, you are ready for power flights.

Using medium power and a 20-30 sec. motor run, try an easy hand launch into the wind. The first job is to adjust for straight glides by changing the rudder angle. Then, if necessary, adjust motor angle for straight power flights. You can stop now, but if you wish, several flights may be made with small amounts of left and right rudder to observe the turning characteristics. However, remember that 1/8" of rudder is a very tight turn, so go easy!

Part 2 will detail the installation of the radio gear, ground check procedures, and radio control flying tips.

Flash

(Continued from page 5)

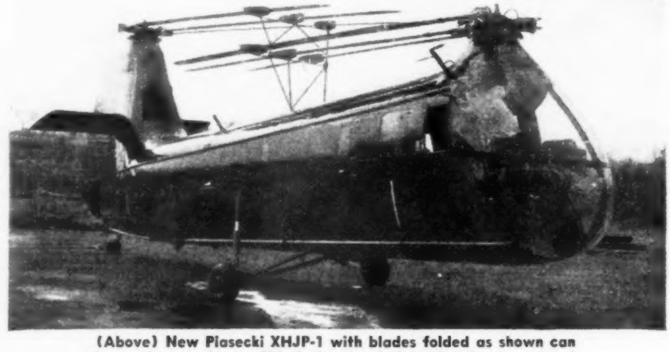
record of 670 mph, even though the *Skyrocket* actually raises the record to the sonic category. The *Cutlass* is fitted with Solar afterburners on its two Westinghouse 24C turbojet engines that about double their output for short speed dashes. And its swept-back wing will also hold down the drag. It's going to be a dizzy spring in the airplane speed world, dizzy with speeds we always used to associate only with rifle bullets and that means "faster than you can see 'em!"

WHILE ALL THIS experimentation has held the news, Air Force has quietly gone about its business of actually getting some of these new combat types into production and squadron use. As a result, the 47th Bomb Group at Barksdale Air Force Base, La., (a unit of the 12th Air Force) has become the first jet bomber group to complete its equipment. It is now equipped with North American B-45A four-jet light bombers. The 1st Fighter Group at March Air Force Base, Riverside, Calif., is now receiving North American F-86A sweptwing jet fighters and its re-equipment from F-80's will soon be complete. That means that 500 mph bombers and 670 mph fighters are now in actual squadron use in the U.S.!

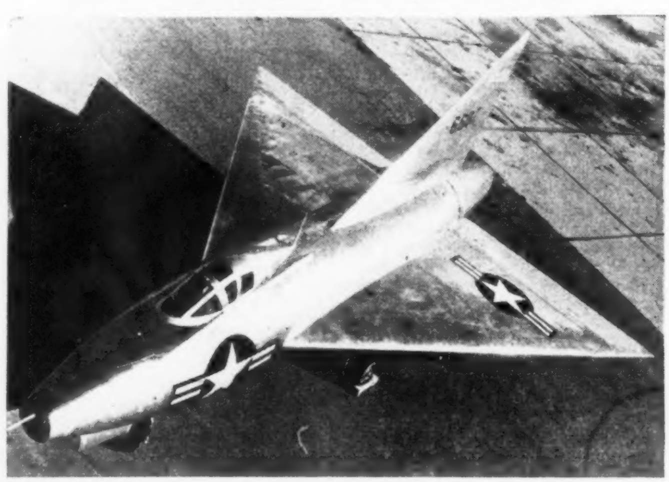
WHILE IT MAY seem a comfort to know that Congress is now moving towards approval of an air warning network across the northern U.S. border, it also reveals to many of us that we don't have such a network now! The scheme consists of 20 Early Warning Radar Centers scattered across the North American continent plus four radar picket ships extending the net from the mainland to the east and west. The new system will cost $85,500,000 for the purchase of the sites required, grading and filling, etc., $26 million for the radar equipment, intercommunication systems between the units, etc., and about $7 million for the four picket ships. Upon completion of the network, the U.S. would have an electronic "iron curtain" hung across its northern approaches from the Pole, over which any Russian attack would have to come. This is only the first step, however, towards a joint U.S.-Canada system that would require $160 million eventually. But whatever the cost we're for it, 100 per cent!

THAT OLD familiar subject, the guided missile, is back with us this month, but this time it's not just in the form of the usual repetitive list of problems. Instead, there's news of success. Air Force has revealed the Convair 774 and the North American *NATIV* missiles. The 774 is a smaller version of the wartime German V-2 with "vast improvements" in its power plant system. It is 32' long (compared to 45' for the V-2) and is a distinct copy in exterior line. It is launched in the same way: vertically without racks. The *NATIV* is a "North American Test Instrument Vehicle" and is only 13' long. It is fired from a long tower containing guide rails and is used to test aerodynamic and control equipment. Although Air Force revealed these two test rocket missiles, it did not reveal the 500-mile missile it wants a new range to test. Air Force has asked Congress for $200 million to purchase a firing range in the west with a base area of 500 miles and a "danger zone" extending for 3000 miles out across the Pacific. Dr. Karl Compton, new chairman of the Research and Development Board, says that 500-mile missiles will be ready for test this year but there is no place to test them. The base area would include shops, laboratories and housing for a community of 13,000 technicians and workers and observation stations every 50

(Turn to page 42)



(Above) New Piasecki XHJP-1 with blades folded as shown can be used on cruisers. This helicopter is intended for sea patrol use. (Below) Dart with a jet! This Convair Model 7002 has made many successful flights, powered by Allison J-33 jet unit



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miles over the 500-mile range. Compton also revealed that missiles with a range of 5,000 miles are now within the range of possibility, the first such assurance available from such a competent technical source.

AIRCRAFT DESIGN and construction has grown in accuracy so rapidly that it became the custom several years ago to hold that the test pilot was no longer a daredevil but merely a check on the calculations that always proved right. But even today in 1949 prototypes are destroyed and test pilots lose their lives. The North American XAJ-1, composite-powered Navy attack plane, recently lost its wings and tail over the Pacific Ocean and took two NAA test pilots to their deaths. Al Conover had done all the NAA test work on the FJ-1 *Fury* jet Navy fighter and other NAA experimental types. Charles E. Brown had only recently joined NAA and led the 1948 Thompson Trophy Race in his souped-up Bell P-39 racer until he was forced out in the next-to-last lap. Since the outer wing panels and the fin of the XAJ-1 fold for carrier storage, it appears possible that these surfaces were accidentally folded in flight through some quirk or failure of their mechanism. A second XAJ-1 is now flying and NAA has a Navy order for 28 of the type for service tests. It is powered by two Pratt & Whitney R-4360 Wasp Major reciprocating engines and a single Allison jet engine in the fuselage for speed bursts.

YOUR FLASH editor witnessed the top air show of them all at Andrews Air Force Base, Camp Springs, Md., recently when President Truman, his cabinet, and Senate and House committee members, asked the Air Force to show their stuff. It was the sort of dare the Air Force had been waiting for (and had helped gently to create) and the result was an air show that put all the rest of them in the shade. It began a week ahead of time when the Air Force ordered its airplanes to start heading for Andrews in "routine, uneventful" fashion. First to make the trip was the Boeing XB-47, which cruised along at a "routine" 607 mph from Moses Lake Air Force Base, in Washington over the 2289-mile course to Andrews. Next day the Northrop YB-49 *Flying Wing* ambled along over the Muroc-Andrews route at 511 mph. Same day a giant Convair B-36A flew in from Fort Worth, Tex., at an average 338 mph and a North American F-86A raced over the Dayton-Andrews route at 710 mph. (All had comfortable tail-winds, for sure!)

HIGHLIGHTS of the demonstration was the JATO take-off of the XB-47, the equally fast-climbing take-off of the Northrop YB-49 and a race between the XB-47 and two jet fighters, just to show the high-level crowd what aviation had come to. First, the XB-47 passed a Lockheed F-80C jet fighter in flight without effort, and Air Force swears the F-80 was flying all out. Then the XB-47 took on the F-86A, but lost the race by a nose, proving that the giant, swept-wing bomber, which carries the same bomb load as the wartime B-29 (only faster!), is about the fastest airplane in the skies, losing out only to the fastest combat airplane in the world! Whew!

REGARDLESS OF how you may feel about the Convair B-36 bomber as a strategic weapon, you've got to admit it really packs a belly-full of bombs. Recently the monster took off from Fort Worth, flew to Muroc, circled around for a while and dropped TWO 42,000 lb. bombs, after which it cruised back to Fort Worth and settled down for the night. It's pretty hard for the layman (or even an expert) to imagine just how much 84,000 lbs. is, but a rough idea is that it is equal to about 25 average-size automobiles!

FINIS FOR the two-seater? "Yes," says William T. Piper, president of the world's largest producer of two-seat personal aircraft. Piper believes that the two-seater is definitely on the way out, except for such special jobs as training, crop-dusting, etc. The reason is two-fold: Piper points out that many four-seat personal aircraft are now selling for less than many two-seat airplanes, and that's about the best reason in the world. Another reason is just sheer human nature, which would much rather take an extra couple along in the back seat than make the trip alone. How many times have you gone out to the airport with a party of friends and everybody waited patiently while each of them went up for a hop one at a time? Piper is backing his contention with his new Piper *Clipper*, a trim four-place high-wing monoplane that sells for just $2995! (Try getting a four-placer for less than $10-12,000!)

THAT OLD WARHORSE, the propeller, is still refusing to give up. Engineers readily admit the jet is slow on take-off and the early part of the climb, but once it gets up to 500 mph then nothing can catch it. But what they didn't know is just how long it takes the jet plane to "get going" as compared to the fast-climbing propeller-driven plane. Navy put these theories to the supreme test the other day. They took their pet flying express elevator, the Grumman F8F *Bearcat* (which holds the world's climb record of 10,000' in 100 secs.!) and placed it alongside a twin-jet McDonnell FH-1 *Phantom*, no slouch in either the climb or speed category. Both pilots revved up and raced down the runway. Before the show was over, the *Bearcat* had reached 10,000' and made two high-side passes at the *Phantom* while the latter was still on the way up!

NAVY HAS always been a great service for "try it out" and they recently proved a much-discussed point when a four-engined Douglas R5D experienced starter failure on one engine while getting wound up for a flight. Anxious to keep his schedule, the Navy pilot decided to try windmilling the dead engine into action and raced down the runway with three engines. The dead engine windmilled up to 600 rpm at a speed of only about 75 mph, the engine fired up and the pilot paused only long enough to collect his wager money before taxiing out for his full four-engined take-off!

FLAME SOLDERING

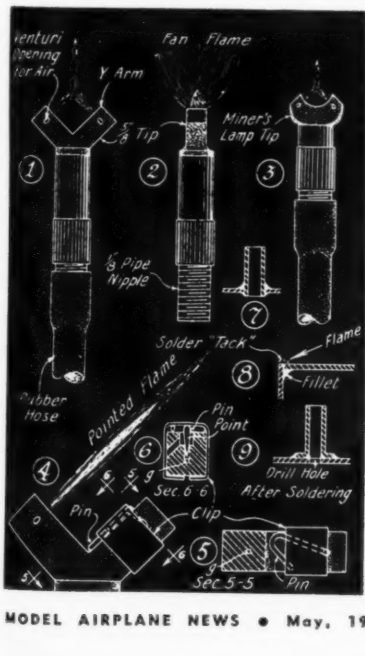
by Ray Rusher

FLAME soldering in many instances is superior to soldering with an iron from the standpoint of mechanical strength and electrical conductivity of the soldered joint. Maximum efficiency is obtained from a combination of iron and flame soldering. A number of examples will be given, and as you become skilled with them many other uses will be found for the inexpensive burner tips here described. They use ordinary city gas available at your kitchen stove.

The main requirement for a suitable burner tip is that it mixes a suitable proportion of air with the gas to give a blue flame devoid of any yellow appearance whatever. A bunsen burner is ideal because it can be adjusted until the flame is all blue. Any presence of yellow which appears at the tip of the flame indicates too much gas for the air being supplied, and the result is incomplete combustion of the gas which smokes the work and seriously interferes with the soldering operation, as all surfaces to be soldered must be chemically clean.

A bunsen burner is too large, however, for most work done by a modeler. An excellent small flame burner consists of an acetylene headlight burner tip of the kind used on automobiles and trucks before the advent of electric headlights. A 5/8" size will be found suitable. Such a tip is shown in drawings 1 and 2. The small size tip in No. 3 is the kind used in miners' head lamps, which are also good but produce too small a flame for most soldering jobs. These acetylene tips give a yellowish-white flame on acetylene but a blue flame on city gas as they incorporate venturi openings that cause the gas to draw air in from each side of the tip and mix it with the gas before the gas is discharged and ignited. The principle is similar to that of the bunsen burner but there is no adjustment. The gas and air holes are so proportioned, however, that approximately the right gas-to-air mixture is had.

The character of the flame is ideal for about half the jobs you will encounter. The construction of the tip is such that two streams of gas and air issue from the arms of a Y-shaped head and impinge each other as shown in No. 1, and the result is a flat flame that fans out as in No. 2, having considerable spread to evenly cover a substantial surface of the work being soldered. Depending on the amount of gas supplied to the tip, the flame can be adjusted between 1/4" and 1" wide.



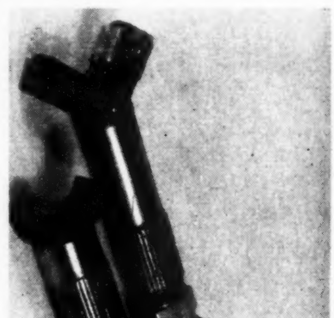
On other jobs a pointed flame is better, and this can be had by plugging gas opening in one of the Y arms of the burner tip. No. 4 shows how this can be done. A pin is inserted snugly into the gas opening as in No. 6, but don't push it in too tightly as the arms are formed of ceramic material and care must be exercised to prevent damaging the edge of the opening. Determine where to bend the pin so that its arm *a* will be about 1/64" above the adjacent surface of the tip. A second arm *b* is bent to hold the pin in the proper upright position when a tin clip is slid over the burner tip arm and the pin. The clip is bent to such size that it springs slightly to hold the pin against dislocation. Gas then issues from the other gas opening only and the flame is a pointed one between 3/8" and 2" long.

Acetylene burner tips are usually threaded for a 1/8" pipe. Screw a 1/8" nipple 1" or 2" long into the burner and slip a length of rubber hose on it. The kind used on hot water bottles is satisfactory. The hose may be connected with the gas supply by removing the burner of your gas stove, which exposes a gas nozzle next to the control valve, and slipping the hose on this nozzle. The control valve is used to control the size of the flame at your soldering tips.

A more convenient arrangement that eliminates the necessity of removing the burner from the stove consists of installing a 1/8" pipe tee between the gas supply pipe and the pilot light, and connecting a 1/8" pipe and a petcock to its side outlet. A 1/8" nipple can then be connected with the pet cock to be received in the rubber hose. Most gas stoves are arranged so that the petcock can be located at the back of the stove out of sight. A 1/8" pipe, elbows and nipples will serve to connect the tee to the petcock in that case.

Now for a few examples using the flame soldering technique. No. 8 shows a fuel tank of sheet tin or brass such as described in February 1946 MODEL AIRPLANE NEWS, page 34. Wipe the edges to be cleaned with a piece of cloth and sand with fine sandpaper to mechanically clean the surfaces. Then apply soldering paste lightly to chemically clean them so that the solder will bond with the metal. The tank walls may be cut and formed so that the edge of one abuts the surface of the adjacent wall as shown; then "tack" solder at a number of points as indicated by dotted lines to hold them assembled. Tack soldering is done with the soldering iron, a "wood burning pen" being entirely satisfactory if the point is tinned. The "tacks" or drops of solder should be about 1/8" apart and not too large as they represent the total solder that will be present in the finished joint.

Next play the soldering flame along the joint pointed in the direction of the arrow.



Burner tips come in many different sizes. Here are two widely used types

leaving it at one position only long enough for the solder to melt and run into the joint to form a fillet. In working along the joint you will find that the knack of just enough but not too much heat is soon learned. Experiment with the fan flame and the pointed flame as both work well in this operation, and you may acquire greater skill with one than with the other. The character of the work also sometimes dictates the flame to use. You should do some practice soldering on scrap pieces first before attempting a finished product.

When the parts are temporarily tack soldered together at a number of points, a small area can be heated at one time without the parts falling apart, and the flame slowly moved along the work while the solder cools and hardens behind it. The heat should be used just long enough for the successive drops of solder to run together, but not long enough for them to flow away from their intended position due to gravity. The solder also runs ahead of the flame if too much heat is applied. After the soldering has been completed, clean off excess solder with a coarse file or a scraper and fine sandpaper.

Filler, vent and fuel delivery tubes of brass or copper may be soldered into holes of the tank as in No. 7. First tin the tube and the tank wall around the hole; then "rough" solder the tube in temporarily with a drop of solder on each side of the tube using a soldering iron, but don't attempt to make the joint fluid tight. The tube will have to be held steady and fixed in relation to the tank wall while the flame is used to melt the solder until it forms a fillet completely around the tube. Holding the tube is required to insure that it remains square to the tank wall and doesn't project too far through the hole. An easier method is to use a tubular rivet or grommet as in No. 9. Rough solder the flanged end of the tube to the tank wall, apply the flame to melt the solder evenly and the flange will keep the tube upright. The hole through the tank wall is drilled after soldering, but make sure none of the drillings remain inside the tank to cause trouble later by clogging your needle valve.

When connecting solder lugs with stranded electric wire, first rough solder with the soldering iron and then use the flame to cause the solder to smooth out and fill all interstices between the strands, thus producing maximum efficiency in electrical conduction. No more solder should be applied than necessary for this purpose without drops of solder hanging from the undersurface of the joint when completed. To prevent any excess solder from running back into the strands and destroying flexibility which is the main advantage of stranded wire, and also to prevent the heat of the flame from burning the insulation, it should be wrapped with wet cloth or string. This is a very important step in the operation. The method can be used on many other jobs too where it is desirable to prevent the solder from going where you don't want it to.

Due to capillary action, solder has a strong tendency, when the parts to be soldered are heated to solder-melting temperature, to spread itself out in as thin a film as it can, and it will penetrate and fill the narrowest of cracks. It will not spread on any part that is kept chilled, however. Another method of controlling it is to smoke any parts on which solder is undesired, match or candle smoke being suitable.

PHOTO CREDITS

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Design Forum

(*Continued from page* 23)

surface, it will provide lift in level flight, as in Fig. 2; however, this lift will be small. If the angle of flight increases 6°, the wing angle of attack increases to 9° and the stabilizer to 6°. If the *zero angle of lift of both wing and stabilizer is minus* 3°, then the wing has increased from an *effective* lift angle of 6° in normal flight to 12° in this particular case, (3° + 3° + 6°). The stabilizer has increased from an effective lift angle of 3° to 9°, (3° + 0° + 6°). Throughout this range of angle of attack, the lift on each of the surfaces is approximately proportional to the effective lift angle of each surface. Therefore the lift on the wing at 6° increase of flight angle is doubled, because the original effective lift angle of (3° + 3°) or 6° is doubled, while the lift on the stabilizer has tripled because its original effective lift angle of (3° + 0°) or 3° has increased to 9°.

So, we see in Fig. 4 that while the couple LN has doubled, the couple MT has *tripled*. The latter is the corrective couple and is larger, so a corrective or nosing down tendency, required for recovery and resumption of normal flight, is produced. However, though this recovery is *positive and sure* it is not sudden and therefore does not throw the airplane into a steep diving position before the pull of the propeller has a chance to increase the speed of the airplane to normal.

We do not say that the tandem arrangement cannot produce a dive; we say that a tandem can be so set up that a dive will not result from a stall. In other words, we have shown that the properly arranged tandem is the cure for the deadly stall. Even the C.A.A. has worried about the stall to such a degree that they forbid the use of tandems or planes with lifting stabilizers under their regulations. Whether or not a tandem is dangerous truly is important, but the more important point is that such dictation borders on tyranny and smothers possible improvements in the tandem field, because it specifies HOW a result shall be achieved and not merely WHAT shall be achieved.

A tandem airplane is actually very dangerous when viewed from the eyes of the C.A.A. because they consider it with the same proportions as the orthodox airplane, that is, with the *same size of tail surfaces*. The fact that, when designing a tandem airplane *the tail surfaces* naturally *must be enlarged*, seems to have been overlooked. The enlargement or increase in area must provide an increase in the moment TM equal to the sum of the moments WN, Fig. 3 and LN, Fig. 4. The normal full scale airplane usually has a stabilizer area which is approximately 15% of the wing area. Practice shows that for a tandem airplane this area should be increased to approximately 30%, in other words doubled. This extra area provides the extra nosing over tail moment sufficient to overcome the opposing moment LN, and its action is very large when there is a slight increase in angle of attack. This tends to *prevent stalling*. On the other hand, this arrangement produces *a gradual* nosing over corrective moment and not *a sudden over correction and dive* at the point of stall. It is obvious that regardless of the size of the moments due to L and T, the moment WN, due to the pull of gravity W, will be clockwise and will never have a tendency to nose the airplane over into a dive in a tandem arrangement of surfaces because it is rearward of the lift force L.

All of this has gone far beyond the realm of theory and, in fact, the results of thousands of actual flights have upheld this theory. Hardly a model plane takes the air today that does not conform to the tandem arrangement in Figs. 2 and 4. Nearly all model airplanes have cambered lifting tail surfaces and in fact they fly and retain their stability only because of this, not in spite of it.

In 1919 the author had occasion to design several flying models for a large manufacturing concern. These were to be manufactured in quantity. Several months of struggle and difficulties resulted from experiments and test flights with models using nonlifting or flat stabilizers and with the arrangements shown in Figs. 1 and 3. Every trick was tried to make these planes fly properly—without success. They did fly occasionally but not consistently and with complete stability. Finally the use of cambered lifting stabilizers suggested itself. From the very first test these models flew perfectly and no more difficulties were experienced. Since that time this trick has been used to correct the instability of many other types of models.

Flights of the 8' span *K.G.* gas model brought out the virtues of this arrangement vividly. In fact, demonstrations of this plane with the C.G. 50% of the cord rearward of the leading edge of the wing and with the stabilizer set at 1° positive so that it generated lift in normal flight, at Roosevelt Field, where Dr. Alexander

Klemin was an observer, demonstrated clearly the nonstalling characteristics of this arrangement. During this demonstration the plane was made to take off and deliberately stall when 15' from the ground; the nose was inclined at an angle of 30°. Upon stalling, the plane sank gradually under the pull of gravity without the nose dropping into a dive or the plane falling off to one side or the other. By the time that the plane had assumed a level flight position and before it had reached the ground, it had regained its flight speed. This same test was made in exactly the same way again, except that the motor was deliberately cut at the stalling point. Instead of diving-in as a normally setup airplane would have done, the plane gradually sank until it had assumed an approximately level position and landed without a jar. This maneuver was deliberately repeated at will with the same results. There was no sharp nose-down dive.

Although thousands of model builders have used this arrangement, few have realized its significance. Evidently, Mr. Berkley gives considerable thought to such matters. From his own experience he has observed the values of the tandem. And without reservation we agree with him, as he says in his letter, that something should be done to show the virtues of the tandem and to have the C.A.A. change its rulings. No rulings should exist which discourage future worthwhile developments.

One of the arguments which we understand the C.A.A. brings up against the tandem arrangement is that it will spin readily even though the lifting stabilizer corrects or improves longitudinal stability. They are right, provided the necessary changes are not made in the fin area. Naturally instability will result if only the C.G. position and stabilizer area are changed, *without changing the fin and rudder area.* The fin area should be increased also to a size sufficient to dampen out or overcome any increase in spinning tendency. Of course, it can be shown that in certain cases the fin area does not prevent spinning. An airplane can be made so that spinning will take place under any condition, but in normal cases increasing the fin area prevents spinning because it tends to dampen out rotation about the vertical axis. Briefly, the whole trick of making a plane stable with lifting rearward surfaces is to make these rearward surfaces with sufficient area to correct stalling and spinning. Diving is prevented by locating the C.G. to the rear of the lift force on the forward wing.

In the October 1948 issue, page 39, we published a side view of a proposed 3 place full scale airplane, Fig. 5. We gave the general specifications of this plane and requested that readers send in their comments concerning it, a reversal of our usual procedure; usually readers send in designs for our criticism. We received a criticism of it from Mr. R. Patrick Wheeler of Sherwood, Clifton, Capetown, S. Africa. Mr. Wheeler is secretary of the S.A.M.A.C. Some of his criticism we feel is excellent. His chief criticism is that the C.G. will be too far back due to the short nose and rearward engine, Fig. 5 and that much trimming will be necessary for solo flight. He suggests a larger tail with a lifting component. Here again we see the value and use of a lifting stabilizer. This will help to take care of any variation in the C.G. position due to solo flying or flying without a full 3-passenger load. Obviously if there is only one passenger in the plane, the nose of the airplane will be light and the center of weight will be rearward of its normal and best position. Consequently, this plane must be so designed that the stabilizer will be sufficiently large and so that it can be trimmed to take care of the change in the C.G. position as required.

We believe that the nose of this plane is a little short and that it should be lengthened as indicated by the dotted outline. This will not only bring the weight forward and help to give better balance but will lengthen the wheel base and provide better take-off qualities.

Mr. Wheeler says, "The car body part would seem rather high even for town driving, especially with a tricycle arrangement which can so easily tip over on a corner." This would be true provided the C.G. of the car is at the center of the car or half way between the front and rear wheels. The *effective* tread in such a case would be narrow and there might be a tendency to tip over. However, in this case the C.G. is well toward the rear, nearer to the rear wheels than to the front so that the effective tread is nearly equal to the wide tread of the rear wheels.

Mr. Wheeler feels also that the cost of building this plane might be comparatively high. He cites the flaps as an example, because they are usually heavy and expensive. Normal flaps *are* heavy and expensive. However, so are crash landings, so a flap has been developed, and will be used on this airplane, that gives greater lift than any other flap and yet which is no more complicated than the single segment slotted flap. Nothing can be too

1949 NATIONAL MODEL MEET OFFICIAL ENTRY BLANK

AMA Sanctioned AAAA Model Airplane Championships held at U. S. Naval Air Station, Olathe, Kansas (Indoor events Municipal Auditorium, Kansas City, Mo.) 26th through 31st July

Sponsored by Olathe Chamber of Commerce and American Legion Post No. 153
Address all correspondence to JESS HALL, Contest Director, Olathe, Kansas

PLEASE ENTER ME IN THE FOLLOWING EVENTS OF THE 1949 NATIONALS AT OLATHE (check events):

Indoor hand-launched glider ....
Indoor stick event ....
Indoor cabin ....
Mulvihill stick ....
Stout cabin ....
Tow line glider ....
CO2 free-flight ....
Free-flight gas Class A ....
Free-flight gas Class B ....
Free-flight gas Class C ....
Free-flight gas Class D ....
Free-flight gas seaplane ....
Radio control ....
Control line speed Class A ....
Control line speed Class B ....
Control line speed Class C ....
Control line speed Class D ....
Control line speed Jet Powered ....
Control line novelty ....
Control line scale ....
Control line precision ....
Outdoor hand-launched glider ....
Flying scale rubber powered ....
Pan-American "PAA" Load Event ....

TOTAL ENTRY FEES ....
Enclosed Check ( ) Draft ( ) Money ( ).

RESERVATIONS FOR HOUSING

Male contestants will be housed at the Naval Air Station, Olathe, for 35 cents linen charge for the entire six days. Both male and female contestants will be furnished three meals daily at about $1.05 per day, or portion thereof, at the Navy's general mess.

Reserve quarters at Station ....

Reserve Trailer space for ....

Reserve rooms in private home ....

Hotel reservations for ....

(State dates for nights wanted and accommodations and rates preferred.)

●

I hereby release the sponsors or directors of this contest, and the U.S. Navy, from responsibility for any claims of damage, loss, or injury resulting from any cause while attending this meet, and I also assume full responsibility for any damage or injury caused by myself or my airplane to any persons or property.

Signed ....

Address ....

City .... State ....

Club Affiliation ....

AMA No. .... Age ....

ENTRY FEES

Basic Entry Fee $1.00
Each event or class entered .... $ .50
Late Entry Fee $1.00

All fees must accompany each entry. Deadline for entries without late entry fee is midnight, July 12, 1949. Entries postmarked after that time will be accepted only on payment of additional $1.00 Late Entry Fee.

●

PARENTS CONSENT, WAIVER, RELEASE:

As parent and/or natural or legal guardian of

....

a minor, I hereby give my full and unqualified consent to his (her) participating in the 1949 National Model Airplane Championships, and to his (her) accepting any and all awards whatsoever that he (she) may win, whether it involves travel or otherwise.

In consideration of their sponsorship of this Meet, I hereby release the Olathe Chamber of Commerce, the Earl Collier Post 153 of the American Legion, The Academy of Model Aeronautics, the U.S. Navy, and any organizations and all persons connected with said meet, from all claims which may arise with said meet.

Signed ....

Address ....

Witness ....

Address ....

*This parents' consent must be signed before entry of any contestant under 21 years of age can be accepted.

(SEE OTHER SIDE—PAGE 48 OF THIS MAY 1949 ISSUE MODEL AIRPLANE NEWS—FOR FURTHER INFORMATION)

expensive where safety is concerned, and the lift of this flap will provide such a low landing speed that the crash impact will be decreased to nearly 1/3 of the impact of a plane without flaps. The airplane may be slightly more expensive but we feel the lack of safety without flaps ultimately would be even more expensive not to mention more dangerous.

One of Mr. Wheeler's chief criticisms concerns performance. He says, "Aerodynamically, assuming C_L to be 0.5 for cruising, the speed of the airplane would equal 278 mph, decidedly high. It is doubtful if 150 hp can cope with this. The hp required for this speed equals 172 at 65% efficiency. With full flaps at sea level landing speed, will be 107 mph. We do not know where Mr. Wheeler has obtained his data for calculating these results. We find them to be very much in error. The maximum speed is determined from hp, area and the drag coefficient, not from the lift coefficient. The lift coefficient in itself does not directly limit the speed of an airplane. It is the drag coefficient which limits the speed. The correct general formula for determining velocity at sea level for average cases is:

$$V=\sqrt[3]{\frac{(430{,}000)\ \text{hp}}{S\,C_D}}$$

where, V = maximum speed in feet per sec.; hp = power delivered by the propeller; S = wing area; and C = the drag coefficient. When applied to this airplane it works out as follows, assuming the propeller to be 90% efficient (a practical value for modern propellers):

$$V=\sqrt[3]{\frac{(430{,}000)\ 135}{260\ (.035)}}=\sqrt[3]{\frac{58{,}050{,}000}{9.1}}$$

$$=185 \text{ ft. per sec.}=\frac{60 \times 185}{88}=126 \text{ mph}$$

You see we obtain the maximum velocity 126 mph.

Since this design was offered, it has been modified to increase the speed. The power has been increased to 175 hp and the wing area reduced to 220 sq. ft. The calculations are as follows:

$$V=\sqrt[3]{\frac{430{,}000\ (157)}{220\ (.035)}}=\sqrt[3]{\frac{67{,}510{,}000}{7.7}}$$

$$=207 \text{ ft. per sec.}=141 \text{ mph.}$$

The maximum velocity, therefore, is 141 mph under these conditions.

You may wonder how the drag coefficient has been determined. This varies greatly with different designs of planes, depending upon the airfoil used and the parasite structure of the airplane. For wings alone, C_D varies from .015 to .025 *at 0 to 2° angle of attack*. This usually is the angle at which an airplane flies at high speed. For clean airplanes (including wing and parasite structure) C_D equals from .0225 to .0375. For airplanes that are moderately clean, as far as parasite drag is concerned, C_D equals .030 to .050. The airplane in Fig. 5 has a low drag wing and falls in this class, so we have figured a drag coefficient, C_D, equal to .035. For airplanes similar to the Piper *Cub* which have square bodies and considerable external structure, such as landing gear, wing struts, high wing drag, etc., the drag coefficient equals .038 to .063. The variation in drag in any class depends upon the wing used as well as upon the amount of external parasite structure. Naturally at higher angles of attack the drag will increase but at maximum speed where the angle of attack is small the drag is usually at a minimum.

The speed of 126 mph given by this formula is quite different from the speed of 278 mph quoted by Mr. Wheeler. Also there is considerable error in Mr. Wheeler's landing speed calculation.

The true landing speed of the original airplane is given by the general formula:

$$V_L=19.76\sqrt{\frac{W}{S\,C_{L\,\max}}},$$

where V_L = landing speed in miles per hour; W = total airplane weight; S = wing area; and $C_{L\,\max}$ = the maximum lift coefficient, which with flap fully depressed is 3.6. (A full span flap is used.)

Inserting the correct values for weight, area and lift coefficients, with flap fully depressed, the calculations are as follows:

$$V_L=19.76\sqrt{\frac{2500}{260\ (3.6)}}=19.76\sqrt{2.67}$$

$$=19.76\ (1.63) \text{ or } V_L=32.21 \text{ mph.}$$

So we see that the landing speed is 32.21 mph. Quite a difference from the speed of 107 mph quoted by Mr. Wheeler. Use these formulas when calculating the performance of your "brain children."

Don't forget to send in your plans, ideas, or criticisms. Interesting questions each month will be selected for answer in this column. Address contributions to Design Forum, c/o Model Airplane News, 551 Fifth Avenue, New York 17, New York.

(SEE OFFICIAL ENTRY BLANK ON OTHER SIDE—PAGE 47 OF THIS MAY 1949 ISSUE MODEL AIRPLANE NEWS)

Official Information Bulletin 18th National A.M.A Model Airplane Championship Meet

WHERE

Outdoor events at the U. S. Naval Air Station, Olathe, Kansas.

Indoor events at the Municipal Auditorium, Kansas City, Missouri.

WHEN

Competition: July 26th through 31st, 1949 (six days).

Registration: July 25th and 26th (Monday and Tuesday).

OFFICIALS

Contest Director, Jess Hall, Olathe, Kansas.

Contest Supervisor, Val Sherrard, 1021 W. 6th, Topeka, Kansas.

Directors: Rubber & Glider, Indoor and Outdoor:—Jim McClelland, Independence, Kansas.

Control line speed:—Richard Gelvin, St. Louis, Missouri.

Control line stunt: Roy Mayes, California. John Clemens, Dallas, Texas.

Free flight Gas:—Leo Rutledge, Wichita, Kansas.

Radio Control:—June Pierce, St. Joseph, Missouri.

Field Manager:—L. L. Cooke, Kansas City, Missouri.

Recording and Timing:—Mom and Pop Robbers, Oakland, California.

Timing will be by members of the United States Navy under the supervision of field judges certified by the Academy of Model Aeronautics.

HEADQUARTERS AND REGISTRATION

Legion Memorial Building until July 25th. From July 25th on, Headquarters will be at the Naval Air Station, Olathe, Kansas. All advance entries should be made to Jess Hall, Contest Director, Olathe, Kansas.

HOUSING

All male contestants may be housed aboard the Naval Air Station at 35 cents (linen charge) for the six day event. Meals for all contestants will be provided at the Navy Mess Hall at about $1.05 per day or portion thereof. Female contestants will be provided suitable accommodations in private homes in Olathe at very low cost. Persons desiring hotel accommodations in Olathe or Kansas City (26 miles away) should submit requests to the Contest Director at the earliest possible moment.

Contestants living aboard may use the Navy swimming pool, the largest in the Midwest. Bring your trunks.

A 24 hour guard is provided by the Navy at the dormitory aboard, but the Navy assumes no responsibility for loss or theft. Locker space is very limited.

Parking space is ample adjoining sleeping quarters and workshop.

All bus, rail, and airlines converge on Kansas City. Busses of the Missouri Pacific Trailways marked "Olathe Base" leave the terminal at 11th and McGee, Kansas City, hourly.

Ship all planes and personal gear via Railway Express direct to Olathe, Kansas.

MEETINGS

The Academy of Model Aeronautics will hold Executive and Leader meetings, in addition to Contestant meetings, during this period.

PRIZES

In addition to the coveted perpetual awards, new perpetual trophies will be announced later. The permanent trophies this year are exclusively designed for this meet, and have never been equalled in distinctiveness. Added events, such as the Pan-American Airways "PAA" Load event, will be explained later.

ADDED

On the afternoon of July 30, and again on July 31st, the Navy will present an air show for the entertainment of both contestants and spectators.

VICTORY BANQUET

An outstanding Victory Banquet will be held Sunday evening, July 31st, after which trophies, prizes, and awards will be given to winners in the 51 events. In addition to perpetual trophies, permanent trophies will be given to the first four places in each event, with suitable recognition made through the first 12 winning places—this, in addition to merchandise prizes provided by the model industry.

GENERAL INFORMATION

The U. S. Naval Air Station, Olathe, was established in this part of Kansas because it lies outside of the high wind belt. Maximum free-flight recovery is assured by down-wind ramps, radio communication, recovery jeeps, flight cover (provided by the Sheriff's Air Patrol of Jackson County) and by the fully organized co-operation of surrounding farmers, and state and local police patrol.

Eleven new world records were established at the Nationals at Olathe in 1948, and free-flight recovery was 93.3%.

A complete line of model airplane parts and accessories will be available at the Meet workshop. Food and drink for contestants and spectators will be provided at concessions on the Naval Air Station.

Church services will be held at the Station Chapel on Sunday, July 31st.

Every effort will be made to make your visit to the 1949 Nationals at Olathe a pleasant and satisfactory one. Additional information may be secured from:

JESS HALL, Contest Director
Legion Memorial Building
Olathe, Kansas.

Cessna 195

(*Continued from page* 19)

One of these unsung and forgotten pioneers is Clyde V. Cessna. Like many young men, the early successes of the Wright Brothers inspired Cessna to a future in the air and he began studying every available bit of technical information on the art of flying as early as 1908. By the following year he had amassed enough information to convince him that he could design and build his own airplane, and construction of the first Cessna airplane was begun in 1910. Finally, on April 16, 1911, young Clyde Cessna soared aloft from the vicinity of Enid, Okla., in his own airplane, a date marking Cessna as one of the true American aviation pioneers. Nor was his first airplane merely a slavish copy of the Wright or Curtiss biplanes. Cessna's first airplane was the "radical" monoplane, a configuration he used throughout his career. That first Cessna airplane featured the identical layout used in the new Model 195. It was a tractor design with a two-wheel main gear at the front, conventional tail surfaces at the rear of the truss fuselage, and a monoplane wing.

In the years following World War I, the "daring aviator" was the toast of the nation and it was the men who flew that reigned as kings of the air. Today, pilots are thought of only as professional experts doing a job and the national heroes are the men of science, design and production. Such men as Donald Douglas, Glenn L. Martin, Larry Bell and others are renowned throughout the land. But in the 'twenties, the builders of airplanes were an obscure breed and the pilots claimed the headlines. Walter Beech was one of these and, since it was the fashion to build an airplane company around a famous flying name, Beech, Cessna, and Walter Innes, Jr., formed the Travel Air Manufacturing Co. in Wichita on February 5, 1925. Walter Beech flew their historic biplane sportster to victory in the 1925 and 1926 Ford Reliability Tour and the fame of the new company and its products was established.

But Clyde Cessna still harbored the dream of his own manufacturing company and it finally came true on September 8, 1927, when the new Cessna Aircraft Co. was founded in Wichita, a company that has continued to this day, nearly 22 years later. Cessna founded his company on the merits of the monoplane wing, which he had believed in faithfully for 16 years. His first product was the Cessna Cabin Cantilever Monoplane, which announced its inauguration by winning the "Class A" transcontinental air derby to the 1928 National Air Races in Los Angeles. Another airplane of the same type made the fastest time in the "Class B" race.

The new monoplane was an instant success and more than 50 were produced the first year of existence of the new company. Three, four and six-place models were produced, the factory expanded and Cessna was caught up in the unrivaled whirlpool of personal aircraft sales and flying in the late 'twenties—until the Fall of 1929. The crash cast a pall over the lightplane production business from which it did not recover for a decade and the virtual cessation of private airplane sales deluged Clyde Cessna as it did everyone else. Travel Air was taken over by Curtiss-Wright and reorganization and merger of the entire industry followed.

But Cessna continued to struggle until 1934, when his two young nephews, Dwane and Dwight Wallace, raised the needed capital and the plant was "re-

opened." Subsequently, Dwane bought out his brother's interest, and today is president and general manager of the plant at Wichita. The years that followed marked Cessna with continuing success. The famed *Airmaster*, a continuation of refinement and development of the original monoplane, won prize after prize for efficiency and was long billed as "The World's Most Efficient Airplane." The T-50 twin-engine monoplane was introduced and was hardly into commercial production before the outbreak of war in Europe heralded an entirely new role for the Cessna plant in Wichita: warplane production.

The RCAF selected the T-50, which it dubbed the *Crane*, as an advanced training plane. As production got under way on this Jacobs-powered version, the Air Forces requested a Lycoming-powered version to be known as the AT-8. Finally, the Jacobs engine was standardized and the twin-engine monoplane saw war service as the AT-17 Air Force Trainer, the UC-78 Air Force light transport, and the JRC Naval Aviation light transport. During the war Cessna actually produced the astonishing total of 5,359 of these twin-engine models, due principally to its early start in the aircraft production program. However, the severe cutback in trainer production early in 1944 brought a halt to Cessna's war role and the last Cessna twin-engine plane was delivered in March, 1944.

This proved a blessing in disguise, however, for Cessna was able to begin planning its postwar personal aircraft line much earlier than most of its competitors. Again, however, Cessna continued its high-wing monoplane tradition. The Cessna 120-140 (same airplane powered by a Continental 85 hp and 90 hp engine, respectively) was an instant success and the all-metal high-performance (cruise better than 100 mph) two-seater began to be seen throughout the nation.

Meanwhile, Cessna concentrated its design team on the new four-place model that promised to become the "most desired" type in the years following the first rush to buy two-placers. This early prediction proved exactly correct and actual sales of personal aircraft during 1948 showed that 3565 four-place airplanes were sold during the year out of a total of 6969, or better than one-half. This year, the percentage of four-place airplanes will far outstrip two-placers.

Cessna led the 1948 parade by selling 1631 airplanes worth $6,768,000. This sales record led the field by a wide margin, with the famed Piper Aircraft Corp. trailing by 152 airplanes. And the biggest and most powerful model in the Cessna stable is the four-place Model 195, easily the cleanest-looking high-wing model on the market. The big monoplane is powered by a Jacobs R-755 seven-cylinder, radial, air-cooled engine developing 300 hp at 2200 rpm and 350 hp at 2500 rpm in the most powerful model. This engine is neatly cowled in the 195 nose, so snug, in fact, that tiny streamlined cups are mounted over each rocker-box cover.

The 195 features the simple, spring steel cantilever landing gear perfected by Steve Wittman, ubiquitous air race pilot. The four-place cabin is laid out for a minimum of external size but with a maximum of internal room. The seat cushions use "No-Sag" springs and foam rubber to give about the softest seat now flying. There is plenty of leg room between the front and rear seats. The rear bank of seats can actually accommodate three passengers comfortably, making the 195 a five-place airplane with adequate comfort and performance. The front seats are adjustable forward or rearward as much as 14". Behind the rear seats is the luggage compartment, easily reached from the interior. A retractable step permits entrance and exit from the cabin. The control column can be rotated over to the right side permitting either of the occupants of the front seat to fly the airplane. The two-way radio equipment features a loudspeaker permitting everyone to hear what is going on.

Construction is all-metal throughout. The wing has a span of 36′ 2″ and the fuselage is 27′ 4″ long. It stands 7′ 2″ high. The cabin is 47″ high and 104″ long. The door is 43″ x 31″ and the luggage door is 25″ x 22″.

A Hamilton Standard Constant Speed two-blade propeller is used, insuring maximum engine performance at all times. The 195 has a top speed of better than 180 mph and cruises at more than 165 mph at 7000′ at 70% power. It has an initial rate-of-climb at sea level of 1200′ per minute, and that is *some* climbing for a personal aircraft. It can operate up to 18,300′ service ceiling and has a range of 750 miles.

The Cessna 195 weighs 2030 lbs. empty and 3350 lbs. fully loaded with four passengers, 200 lbs. baggage and 70 gals. fuel. It sells for $13,750 f.o.b. Wichita, which means it's certainly not for the cub pilot but is ideal for executive travel. Its high speed and long range make it ideal for the busy salesman or company executive, who must cover distance fast and conveniently.

Theory of Rotorplanes

(*Continued from page* 15)

a greater lift. The rotor may be incorporated in a wing structure, either midway as in E or as a leading edge, F. By doing this we can eliminate some of the symptoms because the wing portion can carry enough aileron to blank out precision effects. But, at near-stalling speeds, where the aileron loses its effectiveness, the gyro couples will still be there, ready to upset and bring on a full stall at the first prompting.

By rigging the ship nose heavy, that is, by moving the center of mass ahead of the rotor axis, we can damp precession by putting it at a mechanical disadvantage, and still obtain climb and level flight by means of strong stabilizer adjustments. Power-off will not result in a dive since descent is controlled by the rate of autorotation of the rotor, but the ship will descend with its nose well down nevertheless.

Doubtless none of these expedients provide the correct answer, but the important thing is they offer clues to possible future correct answers. Anyway one is inclined to look at it, the rotor ship offers a challenge to the inventive experimenter. Here is something to tackle which has not already been done a 100 times over—it has not, in fact, been done even once in such fashion that the rotorplane has exhibited all the desirable characteristics that have proven out in its fixed wing counterparts. Potentially the rotorplane could be great; it might be the future "really safe" airplane since the rotor will permit a certain fixed rate of descent no matter what happens. Your ideas are as good as the next fellow's in this practically virgin field. Somebody is bound to do it sooner or later. Why not you?

CHANCE OF A LIFETIME!

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Factory Close Out!

Never before in model plane history has there been an offer like this! Two of America's most famous, *top quality* engines are being closed out at a *fraction* of their established price—far *less* than the actual manufacturing cost! Why? Frankly it's because we are so busy making precision camera and television equipment that is is impractical to continue making engines.

Do not confuse the Bullet and Torpedo Special with cheap, inferior motors built to sell at a low price! They are finest *quality*. Thousands have been sold at $12.75 and $18.50 through hobby shops. They have set performance records at many model meets and are well-known for their dependability and durability.

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Exceptional buy in **TOP QUALITY RPM SPINNERS** Machined from Solid aluminum bar. ¼" or 5/16". Formerly $1.75 **Now 75¢**

The Torpedo Special is one of America's finest engines. • Displacement—.30 cubic inches. • Bore—.711. • Stroke—.750. • Weight—7¾ oz. • Double ported exhaust. • Crankshaft—one piece steel alloy. • Piston—Meehanite ground. • Bearings—Naval bronze for crankshaft.

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(No C.O.D.'s) (Add 2½% Sales tax in Calif.)

Name ______
Address ______
City ______ Zone ______ State ______

Scale Towliner

(*Continued from page* 17)

strut bases.

When wings are thoroughly dry, remove them from your work bench and carve the leading and trailing edges and the tips to their proper streamline shape. Sand the entire wing structures with fine emery cloth.

Now cover the wings with the best and lightest tissue available. The model illustrated is entirely covered with the khaki tissue. One piece of tissue with the grain running spanwise is used on each side of each wing panel. Use clear dope for best covering results—clear dope just like you use for doping is the best covering adhesive. It is absolutely not necessary to apply dope to each rib and spar when covering; in fact, a much neater job will result if the adhesive is brushed *only* on the outline of the part being covered with the following exceptions: the aft slightly concave portion of the bottom of each rib and the strut support base. When the wings are covered, spray them lightly with water and remove tag ends of tissue. When the tissue has dried, dope down the rough edges and then dope the entire wing panels. To prevent warping, coat each side at the same time as follows: dope between the ribs 1 and 2 on the top side; then dope between the same two ribs on the bottom side. Set the wings aside to dry. Two or three more coats of clear dope may be added.

EMPENNAGE. Trace a plan for the left side of the horizontal stabilizer as you did for the wing. Build elevators and rudder directly over the plan. Use 1/16" flat material for both tail pieces. A symmetrical air foil is easily added by cementing additional 1/16" sq. pieces to each side of each rib. When finished, sand all edges to streamline shape and cover with khaki tissue. Spray with water and dope as you did the wings, taking care to prevent any warping tendency.

When tail surfaces are finished, cement the elevators in place on top of the fuselage. If the fuselage sides were cut accurately, the elevators will automatically have the correct slight negative incidence. Cement the rudder in place, taking care that it is aligned exactly along the center of the fuselage. There are no tail struts to contend with.

ASSEMBLY. The wings are now fastened to the fuselage. Make sure that the spar protrusions match the 1/8" sq. holes cut in the fuselage sides for this purpose. Note that dihedral angle is 7/8" beneath *each* tip. Better check the incidence before cementing each wing in place. If okay, cement directly to sides of fuselage and add a bit of cement around the spars where they stick through the sides of fuselage. Carefully mounted in this manner, you will have as strong a wing-fuselage joint as can be made. While these joints are drying, block the fuselage as well as the wing tips in upright position.

Cut one wing strut for each panel from bamboo and sand to a streamline cross-section. Mount the struts as indicated on plans.

SKID. Cut the skid from bamboo and heat so that it will remain in the shape shown; sand it smooth. The skid mounts are small pieces of scrap balsa, hard variety. Cement these in place on the bamboo stringer on the bottom of the fuselage.

Now, cut a small piece of tissue to fit the forward section of the fuselage bottom; the small holes are marked on tissue and cut out so that tissue will fit over the skid supports. Dope this tissue into place.

You may just as well finish covering the bottom and top of the fuselage at this time. Spray and dope as usual, then cement the skid in place. It will be necessary to add a single cross piece at the point where the front-diagonal member enters the Fuselage.

The towline hooks are added next. The writer tried out several hook locations; the best location was found to be the one that is *third* from the front. Other positions are included on plans; if you wish to experiment with this model behind a gas job, you will no doubt have best results with the hook that is *second* from the front.

COCKPIT & CABIN. Bend a wire cockpit former by checking the front view. Cement this in place as indicated. The top and sides of the pilot cabin are small sheets of celluloid cut to shape and cemented in place. The front will require several smaller pieces. Do a neat job on this enclosure as this is one point of detail that should not be muffed. The windows on the sides of the fuselage are of tinfoil; cut a single piece for each side and cement in place. The individual window outlines are black tissue or dope.

DETAILS. Wheels may be added if desired. Your model will be lighter, however, if they are omitted. Also, the wheels are not far enough ahead of the C.G. to be of much aid in balancing. Dope all exposed details like the skid, tail skid, and pilot cabin edges black. The top and front of the nose is doped with olive drab. Outline the control surfaces with ruling pen and India ink; if ruling pen is not available, use strips of black tissue and dope them into place.

FLYING. Balance the model by the wing tips. If correctly balanced, it should nose down about 3 or 4°. Small bits of modeling clay can be used as either nose or tail weight.

Test by gliding from shoulder height. If model stalls, add a bit of weight to the nose; if it dives (very unlikely), add a bit to the tail. When the correct balance is achieved, the glide will be shallow and even. Landings with this job are beautiful. Several coats of dope on the skid will enable it to take a lot of scraping, too.

Towline flying is a real thrill; if you have flown kites, you'll catch on to the system quickly. Use the finest and lightest cord you can get—about 50' of the stuff. Make a small loop on the end of the towline and hook to the third hook from the nose. Set the model on the ground and walk briskly into the wind. Your D.F.S. 230 will take right off and climb rapidly. After twenty or thirty feet of altitude separates you from your model, stop walking. The model will fly overhead and automatically drop the line.

Meet the Slide Rule

(*Continued from page 28*)

Division is just as simple as multiplication and all one must do is to reverse the procedure used in evaluating multiplication problems. For instance, if you were to divide 8 by 4 using this method as in Fig. 3, slide 4 on C above 8 on D and find the answer 2 under the left hand 1 on C. The examples thus far explained just about covers the elementary use of the slide rule, and should larger figures be used than those set forth in this article, they are solved by following the same operations.

It is apparent that problems will often present themselves involving the use of 3 or more numbers, and those which take

World War I

(*Continued from page* 25)

sors was square in basic cross-section. It was composed of four stout ash longerons, connected by ash and spruce struts and braced over-all with single-strand steel wire under tension of turnbuckles. Upper and lower longerons were nearly parallel their entire length, which gave the 504 series its long, thin fuselage. Aft of upright 6, the upper longerons descended gradually towards the sternpost. The lower longerons descended slightly to upright 4, were parallel with the upper longerons to upright 7, and gradually ascended to the sternpost.

The outstanding difference in 504 models up to model K was in the engine mounting. In model K, the engine was overhung from the longerons and supported on two steel bearer plates behind the crankcase. In previous models, the engine was of the bearer type, the front bearer being in the form of a ball race supported on four tubular arms forming extensions of the fuselage longerons. This type of mounting was commonly called a "spider" in the Avro 504's heyday. With the later engine mount change, the power was increased from the 80 hp Gnome to the 100 hp Gnome or 110 Le Rhone. Actually, this new mounting in the model K was such that any rotary engine of 100 hp could have been fitted without requiring any alterations in the aircraft. In addition, adapters were fitted to provide any other rotary or radial engine up to 170 hp, thus making model K a very versatile machine.

Engines were standardized as far as hubs were concerned to take any propeller designed for the horse power available, but a special Avro prop with a pitch of 8′ 8″ and a diameter of 9′, was standard equipment on models fitted with a 110 hp Le Rhone engine.

The front cockpit was generally equipped for a passenger (in most cases the student), while the aft pit was equipped as a pilot's station. Both cockpits, naturally, were provided with complete dual control. Immediately behind the engine was a 21 gal. pressure fuel tank and a 6 gal. gravity oil tank. A 4-1/2 gal. gravity reserve fuel tank was fitted in the center section as well. These tanks were made either of tinned steel or sheet aluminum, as the supply of these materials varied.

Cockpits of the 504K were equipped with standard combat instruments so the student, from the very start of his training, would become familiar with the best flying instrumentation of the day. The instrument panel was a large piece of plywood beneath the cockpit coaming which contained across its face, left to right, an air speed indicator, clock, altimeter, oil pulsometer gauge, and rpm indicator. Immediately above the altimeter, in the center of the panel, was a ball turn indicator, and above that, a navigational compass. Placarded instructions covered the balance of the instrument panel.

Engine controls were located on the pilot's left, and an air pressure gauge was attached to the right rear center section strut.

Secondary fuselage structure consisted of three stringers, tacked to the fuselage uprights and taped to one another. Fuselage sides and bottom, up to the firewall, were fabric covered. Fabric was laced on in the best English tradition. Cockpit coamings and the upper after-deck were thin three-ply. The upper deck forward of the cockpits was sheet aluminum cov-

into account combined operations of multiplication and division. It is here that the slide rule excels in its ability to solve problems in a minimum of time. To solve a problem of this type, the manipulations are identical with those which you have already learned, only instead of performing all multiplications, then doing all divisions separately, it will be found most convenient to do each step in succession. Take a typical problem of 3 numbers, illustrated in Fig. 4. Multiply 3 x 7 x 15. Set the right hand 1 of C over 7 on D, then move the slide until the hairline coincides with 3 on C which gives you your first factor, or 21 on D. The left hand 1 of C is now moved to this mark after which your answer of 315 on D can be found by looking under 15 on C. Combined operations are done in a similar fashion and can be mastered in a relatively short time depending, for the most part, on the amount you practice.

Only the rudiments of the slide rule have been presented here, but if you are the type with a curious mind you will find that problems taking in proportion, squares, square roots, cube roots and circles, may also be done with but a few quick motions. If you doubt the old maxim, "practice makes perfect," this is your chance to prove yourself wrong.

GOING TO THE NATIONALS?

Fill out the entry blank on page 47 and mail it to Olathe, Kans., NOW.

ered, with provision for fuel tank inspection and maintenance.

The standard Avro 504K engine cowl was circular, made of three segments bolted together. Sides of the fuselage just aft of the engine were also sheet metal covered, with large hinged inspection doors provided. All metal cowling material was sheet aluminum.

Landing gear of the Avro 504 series remained the same throughout its life. This structure was supported by two V-shaped pairs of steel tube struts attached to the lower longerons and converging on the front and rear ends of a long hardwood anti nose-over skid which ran parallel to the center line of the machine. The wheels were carried on a conventional axle supported by only two tubular steel struts but heavily wire braced. The axle was not attached to the aforementioned skid. Rubber shock absorbers were provided in the wheel support struts and were encased in large streamlined sheet aluminum covers.

The Avro empennage consisted of a comma-shaped rudder of the balanced type, hinged to the sternpost, a rectangular horizontal stabilizer and a split rectangular elevator. In certain instances, a vertical fin was fitted to the 504 but this was the exception.

Normally, on an 80 hp Avro, the horizontal stabilizer was bolted directly to the upper longerons and in that position was at correct incidence If such a machine were converted to one of the 100 hp types, the rear of the stabilizer was raised 13/16". Although the standard production machines were not equipped with an in-flight trimming adjustment for the stabilizer, a modification kit was available to provide this feature.

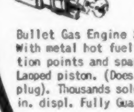
Empty weight of the 504K was 1231 lbs., with a total gross weight of 1829 lbs. Tail loads were light—100 lbs. when fully loaded and on the ground; zero in flight. The airplane had a safety factor of 7 on sandbag test, according to the manufacturer.

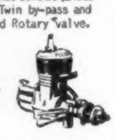
The Avro 504 series has already gone down in history as one of the great airplanes of all time. It will always stand as a tribute to the ingenuity and good judgement of England's pioneer aviator-designer, A. V. Roe.

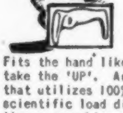
Stinson L5B

(*Continued from page* 31)

where the fuselage longerons meet.
IGNITION. Notice that the coil is mounted on the RIGHT side of the fuselage to counter-balance the weight of the engine cylinder which is mounted horizontally. The flight timer, which is of the clockwork variety, is bolted to a floor in the fuselage. This floor extends the length of the hatch on the right side of the body (the hatch on the full-scale airplane covers a stretcher or freight compartment). The condenser is mounted just aft of the engine firewall. The battery box is supported by two pieces of 1/8" sq. balsa strips that serve as tracks along which the battery box can be moved. This facilitates balancing the completed model. These balsa strips are positioned so that the top of the batteries is even with the lower edge of the windows on the left side of the model. The battery box is mounted lengthwise on the longitudinal axis of the fuselage. When making the connections







from the battery box to the timer and coil, be sure to allow enough slack in the wire to permit fore and aft movement of the batteries. The booster battery connections can be made at any point on the fuselage convenient to the builder. The author located the booster outlets on the original model above the bottom right longeron, between the two doors.

MOTOR INSTALLATION. An *Arden .099* motor was used in the original model. The motor is mounted horizontally so that most of the cylinder is concealed by the engine cowling. This necessitated an extension to the fuel line. This can be done easily with a length of neoprene tubing. A convenient arrangement is to have the end of the tubing project an 1/8" above the top of the cowling to facilitate refueling the engine.

The *Arden* motor is conveniently designed so that it can be mounted on a flat surface—in this case, the firewall of the model. If care is taken in building the fuselage of the model to see that the firewall is at right angles to the longitudinal axis of the fuselage, no difficulty will be experienced from accidental up, down, or side thrust. The top mounting bolt of the engine is bolted through former F-1. This former is made from the same material as the firewall—1/16" plywood. In glueing this member to the firewall, use a straightedge to line up the two, and to make sure they are in the same plane. The firewall itself is bounded on all four sides by the forwardmost uprights and crosspieces of the fuselage.

No plans for the cowling have been included in the drawings, except for the dotted lines indicating the outlines of the cowling on the side and top views of the fuselage. This is done on purpose, as the size of the cowling will vary according to the engine used and to the controls of the engine. The cowling is made from heavy bond paper.

EMPENNAGE. The fin, as noted before, is an integral part of the fuselage. The stabilizer and elevator are made from 1/8" sheet balsa. Elevator and rudder are hinged in the same manner as are the movable surfaces on the wing, and the doors and panels on the fuselage.

WING. The wing construction is conventional. Information as to how to obtain the right wing panel is included on Plate Two. The ailerons and flaps are hinged in exactly the same manner as are the panels and doors on the fuselage. Notice that the hinge line for the flaps is on the lower camber of these surfaces to permit only a downward travel. The two wing panels are joined in the usual fashion, with the spars spliced to each other, and gussets glued on both sides. The dihedral (1-1/2" under *each* tip) is "set" when the panels are joined together. The center section of the wing is covered with cellophane and trimmed with black strips of paper. The wing rests on top of the cabin of the model, and is held in place by rubber bands attached to the front and rear dowels.

The lift struts, extending from the top of the landing gear streamline fillets to the midpoints of each wing panel, are purely for show, and are not used when

See pages 47 & 48

flying the model. The front strut is made from 1/8" by 1/4" balsa strip, sanded to a streamlined form. The rear strut is made from 1/16" x 1/4" balsa. The fuselage end of the struts are joined together in a butt joint on top of the landing gear streamline fillet, and the wing ends of the struts are attached to the wing at points 25% and 60% of the chord.

COVERING. The model is covered with light weight silkspan paper. Two coats of clear dope are applied before the pigmented dope is brushed on. The author's model was colored an olive-drab. However, for added realism, the under surfaces of the fuselage, empennage, and wing should be painted a color known officially as Fuller's Gray.

FLYING. This model is one of the easiest to adjust and fly that the author has ever designed. Because of the movable control surfaces, and the adjustable battery box, all adjustments are simple and very convenient to make. Once the proper settings for the control surfaces and the battery box have been determined, they can be made permanent by a drop of glue and a balsa wedge inserted in the hinge line. Be sure to obtain a good straight glide before attempting any power flights. This will insure a happy landing for the first "power-on solo."

CONCLUSION. Many interesting experiments can be made with this model in the nature of clockwork-controlled wing and tail surfaces, because of the exceptionally wide fuselage which will permit the installation of control mechanisms. The author has been experimenting with an automatic aileron, rudder, and elevator control which consists of a pendulum mounted at the C.G. and free to swing fore and aft, and to both sides. The pendulum is connected to the movable surfaces by controlines, and tends to move the controls in such a way as to restore the model to a normal flight attitude, if the model is disturbed by gusts or crosswinds while in flight.

Scrap Box

(*Continued from page* 8)

probability, it was the high humidity-temperature combination at Akron that sabotaged American brown rubber last year and, if firsthand opinions count for anything, the British have a rubber which, in some characteristics, is superior to ours.

Mel (*Spitfire*) Anderson who has turned out many a fine engine design in his day without becoming rich, sends along drawings and pictures of his new .045 which weighs, less plug, 1 oz. It has a rotary crankshaft valve, fuel tank mounted on rear, and a tangent downdraft carburetor. In between the precocious *Infant* and the .099 *Arden* in displacement, the *Baby Spitfire* will make possible some interesting airplanes, both free flight and controline. All the time, we sneak up on what the average Joe wants.

Now that we have had our first success with radio control, the FCC requirements that a licensed amateur operate the transmitter is giving us a stern pain in the neck. This ruling is basically unrealistic and unnecessary, in our humble opinion. This doesn't mean that we should be permitted to operate all manner of transmitters any way we wish, but it is high time the FCC adopted a realistic attitude toward a growing public interest. Except for the cost, radio control can be achieved by any competent free flighter, so that this regulation is holding back an entire field of scientific development. It so happens that on January 27, Walt Good and C. O. Wright, issued a statement to AMA leaders concerning desirable modification of radio control FCC regulations.

"It is evident that quite a few have writ-

ten to the commission urging that the rules be liberalized immediately," said Wright. "Will you please continue with the campaign in your area and do the following:

1. Get the local clubs to send communications to Washington.
2. Send the communications to the Secretary and the members of the FCC.
3. Send communications to Congressmen and Senators from your state.
4. If convenient, send me a copy (address it to C. O. Wright, 315 West Tenth, Topeka, Kansas) of the letters you are sending so we can centralize the drive from here and follow up.

"What we need is a wide showing of public interest," explains C. O. "If we can get that we should get immediate action. Everybody must do his part."

The recommendations to FCC, as couched by Good and Wright, are as follows: 1—Immediately amend amateur rules to allow the unlicensed modeler to operate the flight controller in the presence of the licensed operator; 2—Immediately proclaim the 27.255 mc. band as usable to the radio modeler with the simplified Citizens' Radio Band license form—a maximum of five to ten watts of power would be sufficient and it is assumed that "factory sealed" FCC type-approved transmitter would be required; 3—Eventual assignment of a special band and special license for radio control modelers.

The address of the Federal Communications Commission is: P. O. Dept. Bldg., 12th St. & Pennsylvania Ave., N.W., Washington 25, D. C. Commissioners are: Wayne Coy, Paul A. Walker, Robert F. Jones, C. J. Durr, George E. Sterling, Rosel H. Hyde, and Edward M. Webster. The Secretary, whom we already have written, is T. J. Slowie. If you hope to fly radio control, get into the fight, and do as C. O. suggests!

From Jimmy Summerfield, in Huntington, W. Va., comes more howls of anguish over the new rules. "Have started a new stunt job," says he. "My only trouble is, I will have to add a landing gear, or one that will retract. Why can't they leave things stand for a few years?

"The wire people will enjoy the longer lines rules in speed, but I am just down right disgusted. I am not poor but it won't take long, if these changes keep coming around. My biggest thrill is the Wakefield because a person knows what to expect." Hear! Hear! Maybe next year, we'll vote those goal posts on the 60-yard line, but they are our own rules, Jim, so we are stuck with them.

* *

"In last season's Chambersburg, Pa., model meet, my pal, Dick Rice, did very well in controline stunt," says W. H. Rambo, of Penn State College. "After all of his aerobatics were done, Dick made his glider pick-up perfectly. Right away his assistant started to set up an object pick-up device. All of a sudden the plane's hook grabbed the assistant's hat from his head. Even if it was an accident, the stunt rated points!"

Yep, that should be tall and true enough for the award of a free subscription to MODEL AIRPLANE NEWS for the best tall, but true, story of the month. P.S. That crack about bibles two months back brought some amended yarns! Don't we have fun.

Air Ways

(*Continued from page 27*)

as for a single cell of the same size, we suggest you delete lines 2, 4, and 6 from the chart. Simply hook as many cells as you want (in series), then adjust the resistor until the current is as noted for a single cell of the same size. The "End Voltage", and "Approx. Chg. Volts Across Battery" should then be measured across each individual cell, not across the whole series.

* *

Our first photograph this month shows Mr. John Appi (The Horse Shoe Hotel & Restaurant, Tottenham Court Road, London, W.1, England) who is a hotel manager, with his free flight scale *Spitfire*. This beautiful model, which has a span of 63", is powered by a 6cc *Stentor* engine. Wings and tail surfaces are of the knock-off type, and when the picture was taken, only glide tests had been attempted. When good flying weather arrives Mr. Appi expects big things from this model; he even dreams in installing radio control in it should it prove to be a good enough flier.

Johnnie Deitch (520 Pine St., Williamsport 8, Pa.) who sent us Photo No. 2 tells us nothing whatever about the model which he is holding, except that it has a 6' span. Johnnie is a member of the *Williamsport Gas Model Club* and sent us a report of this club which will be found in the Club News section of this issue.

No. 3 was sent to Bill Winter by Les Mowbray (no address given) a well-known English model builder and contestant. The airplane he so proudly holds aloft is a design published in our July, 1947, issue. It is a design developed by Winter, and Mr. Mowbray reports extremely fine results from it. We do not know what type of power plant he uses but those big do-nut wheels should certainly allow soft landings.

Another model built from M. A. N. plans appears in Picture 4. Here we see Bruce Packman (5316 Plymouth Road, Baltimore 14, Md.) holding his *Hoverbug* helicopter, made from plans in the September, 1947 issue. He writes that this model has excellent flight characteristics and has repeatedly attained altitudes of over 30'. The endurance is increased by installation of a free-wheeling device which allows the rotors to spin after the rubber has unwound.

A fine model of the Caudron racer appears in No. 5. This ship was built by Ivor Newman (49 Painswick Road, Gloucester, England). It is a controline design with 24" span and is finished in silver blue with black markings. When the photo was taken, the ship had not yet been flown, but under the urging of its Mills 1.3cc diesel we are sure it will get around at a good pace.

A very attractive design characteristic of the increasingly popular semi-scale controline ships appears in Picture 6. This *Torpedo*-powered job was built by A. P. Wilson, Jr. (836 Prospect St., La Jolla, Calif.) who had many fine flights from it. It had a span of 30" and was extremely responsive and stable. Speed was about 80 mph, though the landing speed was quite slow. A great deal of work was put in on the red and white finish which won many compliments for Mr. Wilson. We write up the ship in the past tense, since on the last flight a control wire came loose from the handle and the model was completely demolished. Mr. Wilson adds a note which will be of interest to those who wonder what good model aviation can do for the younger flier. He says, "MODEL AIRPLANE NEWS has been a pleasure and a help in my career as a pilot, in which capacity I am now employed by Consolidated-Vultee Aircraft Corp. at San Diego."

Seems as though "flying saucers" are always with us. The latest photo we have received of one is shown in No. 7. The unusual design which was dreamed up by Francis X. Gruber (386 Second St., Albany 5, N.Y.) is powered by a *Minijet* engine. The fuel tank is mounted just below the wings; the jet itself is completely inclosed and the compartment which holds it is lined with asbestos. The plane itself is an exact circle, 31" across with the elevators attached to the rearmost section.

A real novelty appears in Picture No. 8; here we see Donald Zawada (13953 Monte Vista, Detroit 4, Mich.) holding a radio controlled flying wing which goes by the odd name of *One Lung Lulu*. This ship was the result of cooperation between two U-control fliers, a solid modeler, a free flighter, an aero engineering student, and a couple of amateur radio operators. The ship was built as a project for the University of Detroit 1948 Engineering Show. A symmetrical airfoil was used and power was supplied by a large class C engine. The control surfaces are actuated by a small electric motor in each wing panel, and four radio receivers allowing these motors to be operated independently. Unfortunately, by the time *Lulu* was ready to fly, the engineering show was over, and all the builders engaged in the project were in haste to leave school for the summer vacation. Mr. Zawada hopes to be able to bring this ship out of storage and put it through its paces in the air before he leaves school.

The unusual speedster in Photo 9 was built by Gordon Greenley (address not given) and the picture was given to us by Leonard Weiczorek (368 Baynes St., Buffalo, N.Y.) This ship is a controline tailless job. The rudder which can be seen in the photograph is attached to the dolly and is, of course, left behind when the model takes off.

Test flights showed a speed of 72 mph when the ship was driven by a *McCoy 19* engine.

A very clean free flighter design appears in Picture No. 10. This ship was built by Carl Hermes (322 Storey Lane, Dallas, Tex.) and has a span of 78", a weight of 49 oz., and is powered by a *Madewell 49* engine. Fortunately, the photograph was taken before the model was flown, since shortly after being pictured the ship was lost after a 23 min. flight. Although equipped with a pop-up stabilizer the dethermalizer had not been set as the fliers thought there were no thermals around! Body construction was 1/8" sheet over bulkheads and the wing had a flat bottomed NACA 6409 airfoil. The model climbed almost straight up with no turn, and the engine was set with 5° downthrust; covering was entirely of nylon doped bright yellow.

No. 11 was a very successful CO2 powered model designed and built by Dave Stammerjohan (1619 N. Arcadian, Chico, Calif.). The model was built late in 1947 and made over 100 successful flights but was wrecked by a strong gust of wind. Average flights were of about 1 min. duration but the model turned in better than 5 min. on some occasions.

From southern Australia, we received our last photo of a Wakefield ship built by Boyd Felstead. This photo was sent in by T. Crowe (25 Union St., Dulwich, South Australia) who tells us that the ship employed an Eiffel 431 wing section and T56 brown rubber. Although some good flights were obtained the ship is unfortunately addicted to that old menace, "spin".

NEWS OF MODELERS

PEN PAL SEEKERS: Brian Beashel (16), 41 Clifton Rd., Clovelly, Sydney, Australia . . . C. A. Chittenden, Rt. 2, Box 160, Renton, Washington . . . Harry Barr, 31 Weir St. S., Hamilton, Ontario, Canada . . . R. Taylor (16), Peachcroft Farm, Radley, Abington, Berkshire, England . . . Brian Wolfe, Imperial, Sask., Canada . . . Leif Andersson, 21 Tullslatten, Kalmar, Sweden . . . Colin Harris (14), 132 Worlds End Lane, Quinton, Birmingham 32, Warwickshire, England . . . G. D. Louw (16), 103 MacWilliam St., Ventersposf, Transvaal, South Africa . . . Barrie Reid, Hon. Sec., Wanganui Model Aero Club, 13 Alexander St., Wanganui, New Zealand . . . Kurt Kirchner, Linz—Danube, Landstrasse 57/I Austria . . . Gus Gunter, 21A Windmill Rd., Hampton Hill, Middx, England . . . Tony Ford, Newlyn, 69 Barkby Rd., Syston, Leicestershire, England . . . Vasant R. Kirloskar, Kirloskar Building, Aundh, Dist: Satara, India.

EXCHANGE MOTORS: T. S. Burdett, Six Mount Echo Ave., North Chingford, London E. 4, England . . . Derek Fitch, 23 Blenhiam Terrace, Scarborough, Yorkshire, England . . . R. A. Page, 44 Hansler Rd., East Dulwich, London, S. E. 22, England . . . C. Baites, Nine Wyneham Rd., Herne Hill, S. E. 21, London, England . . . Squadron Leader E. D. Cable, R. A. F., 22 Abbots Park, Chester, England . . . R. D. Margrave, 36 Westfield Ave., Watford, England.

EXCHANGE MAGAZINES, PLANS, ETC.: D. Madhava Rao, "Maya", New Katra, Allahabad 2, (U.P.), India . . . N. Taylor, 31 Gatteridge St., Banbury, Oxon, England . . . Victor L. Batts, 29 The Oval, Farncombe, Surrey, England . . . Alan Butler, 15 Eagle Ave., Tottenham, N. 15, London, England . . . R. Hardy, 54 Rupert St., Wolverhampton, Staffs, England . . . William M. Park, Police Station, Buchlyoie, Stirlingshire, Scotland.

SPECIAL REQUESTS: John R. Millington, 51 St. Oswalds's Rd., Norbury, London, S.W. 16, England, is interested chiefly in contacting an American modeler who likes rubber driven models . . . Jack A. Wilkins, 763 Hazel St., Elmira, New York, want to swap an American kit for an English glider in "kit form". W. Sinclair ENI, USNRTC, Los Alamitos Naval Air Station, Long Beach, California, would enjoy corresponding with collectors of WWI aircraft plans.

CLUB NEWS

California

The *Griffons* will shortly go international and all interested modelers should contact Corres. Sec. Gordon E. Codding at 942 South Gramercy Dr., Los Angeles 6.

Here are the results of the *Oakland Cloud Dusters'* Outdoor Record Trials, held at the Livermore Sky Ranch, January 31, under the sanction from Mr. H. S. Robbers, Sr. *H-L Glider B*—Joe Bilgri 5:06.2; *Towline Glider D*—Joe Bilgri 12:23.6*; *Fuselage D* —Manuel Andrade 5:30.0*; *H-L Stick C*—Larry Mongeen 00:28.4; *Free Flight Gas A*—Manuel Andrade 15:32.6. Record Pending*. Incidentally, the new mailing address of the *OCD* is 3268 Lynde St., Oakland 1.

Results of the *Fresno* monthly free flight meet: *Class A*—Melvin Phillips 5:31.9; *B*—Fred Morgan 10:07; *C*—P. C. Oldershaw 7:51; *D*—Fred Ginder 14:58; *Jr.*—Fred Morgan 10:07.

WHEN WRITING TO OUR ADVERTISERS PLEASE MENTION THAT YOU SAW THEIR ADVERTISEMENT IN "MODEL AIRPLANE NEWS"

PLANE OF THE MONTH

The builders of the tiny Goodyear-class racer called the *Baby Mustang* feel the ship is of such interest to sport pilots, in general, that they are going into production on the design. Whether their gamble will pay off we cannot predict, but the ship is a natural for model building purposes. We will feature the story of its design with authentic plans of the "big" ship as our Plane of the Month in the June issue.

Illinois

The *Chicago Model Nuts* have scheduled June 5 for their annual contest to be held at 79th and Pulaski Rd. Events—Classes A, B, C, and D combined, CO2 and *Infant Torpedo*. AMA Contest Director is Wally Simmers.

Here are the new officers of the *Pretzel Gas Model* Club—Pres., John R. Justice; Vice Pres., Ben Ruehr; Sec., Grant MacKenzie; Treas., James Koym. Write the Sec. (606 West Elk, Freeport) for further information.

The *Aurora Aeronuts Model Plane Club* has scheduled the following contest dates. May 22—Closed club U-control; June 26—Closed club U-control; July 17—Aurora Plymouth Dealers meet; AMA—AA invitational, U-control only; August 21—Closed club U-control; September 18—Closed club U-control. In the "Closed Club Meets," the members are competing for the Air Force Association of Aurora Trophy and the Galloway-Betts trophies. For the Aurora Plymouth Dealers meet, trophies and merchandise will be awarded for the first four places.

Kentucky

The Louisville A. B. C. Model Club has approved and adopted a new set of by-laws, and selected a committee to start work on the contests for this season. Clubs in that part of the country are invited to contact Charles Keeling, 1025 Manning Rd., Louisville, to avoid conflicting contest dates.

New Jersey

Here's another new club to add to the list—*The Jersey Prop Busters.* Several more or less struggling clubs have merged to form this outfit. Among them, the *Bridgeton Whirlwinds* and the *Vineland Aeronauts.* At present there are 40 members. An AMA charter is being applied for. Meetings are held the 1st and 3rd Tuesdays of each month at the Milleville Airport. Officers: Pres., Ed Channels; Vice Pres., Charles Errickson; Sec. Treas., Bill Horton, Jr.

New York

The first meeting for 1949 of the *Thermalites Model Aero Club* of Jamaica was held February 6. Since the club has not been too successful in the past (established by mail in 1944 by two model builders 2000 miles apart!), the members decided to reorganize it completely. Ernie Cyril, formerly of the *Tambe Model Club,* of Brooklyn, was elected Pres., while Don Edmonds, who was one of the long distance organizers in 1944, was elected Sec. Treas., is Gerry Rathan. Meetings are held at 8:30 p.m. every Friday at 172-10 111th Ave., Jamaica. Anyone is welcomed.

The Flying Bisons of Buffalo have been having a lot of fun lately flying their rubber scale models powered with the new midget glow plug engines. Among other types flown were a Fieseler *Störch* and several *Aeronca* designs. Harold DeBolt and Leonard Wagner flew miniature *Stunt Wagons* with fine results. Norris Maltby tells us the club expects to continue this realistic indoor model flying.

Further news has been received about the *Mirror Model Flying Fair* scheduled for June 5 (rain date—June 12). No license, entry and registration fee required. Classification of events: *U-Control*—Speed Classes ½A, A, B, C, D; *Free Flight*—Classes same; *U-Control*—Jet Speed, Stunt (all Classes), Beauty Scale, Beauty Non-Scale; Radio Control. Credentials, registration cards, car stickers, road maps, L. I. R. R. time tables, Grumman Field layouts, and late informational bulletins will be mailed on May 13.

RADIO CONTROL INFORMATION

Because of many requests we receive for information covering all phases of model airplane radio control, we have compiled a list of all articles on the subject that have appeared in MODEL AIRPLANE NEWS. The first of these articles was printed in 1937, but almost all of the issues listed are now out of print. However, most cities have second hand magazine dealers who carry these old issues, and many libraries also have files of them.

Radio Control enthusiasts may obtain a free copy of this list by writing to: Model Airplane News, 551 5th Ave., N.Y. 17, N.Y.

Comprehensive Motor Listings

About once a year we total up all presently available engines, including older types still on the market, and the newest designs just announced. This complete listing, scheduled for our June issue, contains complete construction and performance details on most all the motors available today. You will want to save this for future reference.

Maine

Last year practically every contest the *Augusta Flying Maniacs* attended and participated in was held or governed under different and separate rules. A great deal of difficulty was encountered adjusting to these rule changes. Consequently, all the clubs in Maine have banded together under the name—*Maine Council of Model Clubs*—and are adopting a set of contest rules that will be agreeable to *all*, for *all* Maine contests this summer.

Each club has four representatives that sit in on the Board, one from each age group, plus the club's Pres. Five of the eight Maine clubs have subscribed to this plan: Augusta—*Flying Maniacs;* Bangor—*Hedgehoppers;* Lewiston—*Sky Devils;* Portland—*Propsnappers;* and Waterville—*Flying Aces.* The Council plans to adopt its rules from the AMA. Each club will hold a meeting and decide just what rules their members want in all age groups. Members from each age group will let their representative know just what they expect him to vote for. In this way, when the Council meets in February, it will vote and decide on the rules the clubs desire. The council will also act as a judicial body for all contest and inter-club disputes, acts, meetings, contests, and programs. Any decision will rest with the Council when it pertains to any or all clubs in Maine. Howard E. Smith, *Augusta Flying Maniacs,* Chairman of the MCMC, sent the above info.

Ohio

The *Rubber City Aeronauts,* who are conducting a membership drive, now have 48 additional members. Loving cups will be presented to the members who account for the most new members from the first of the year until the end of the drive. Bob Baughman is credited with 15 members! Here are the results of the first indoor contest of 1949, held at the Akron Armory January 15. *H-L Glider Open*—Dick Obarski 0:34.8; *Sr.*—Gene Kemmerline 0:29.4; *Jr.*—John Humphreys 0:24.0; *Beginner*—Pal Ward 0:16.0. *Paper-Covered Stick, Beginners Only*—Thelma Conrad 2:09.0. *Combined Stick Open*—Ronal Ganserwicz 6:23.8; *Sr.*—Art Weitzel 5:11.2; *Jr.*—Roy Spicer 4:00.6. *Combined Cabin Open*—Dick Obarski 3:44.5; *Jr. & Sr.*—Roy Spicer 3:22.3.

Oklahoma

The new *Oklahoma City Glo Bugs'* officers for 1949 are—Pres., Jim Proctor; Vice Pres., Grant Grumbine; Sec., Dan Marek; Treas., Clyde Riggs; Contest Director, Jim Williams.

Pennsylvania

The *Williamsport Gas Model Club* recently elected officers. Pres., Kenneth Poley; Vice Pres., Lynn Santschi; Sec., Bessie Hamlin; Asst. Sec., Robert Derr; Treas., Ferd D. Page, Jr. There are some 45 members and the club is still seeking additions; write Johnnie Deitch (520 Pine St., Williamsport 8) who will give the information required.

Wisconsin

We have news for the modelers of Madison and the University of Wisconsin—the *Madison Gas Model Club* has been re-established and boasts of approximately 50 members. AMA chartered and interested in all phases of building and flying model ships. Meetings are held at the Madison Eagles Club on the 2nd and 4th Tuesday of each month, at 7:30 p.m. Model enthusiasts are invited.

Index to ADVERTISERS IN THIS ISSUE

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